Cristiano Codagnone and Maria A. Wimmer (Eds.)

Roadmapping eGovernment Research

Visions and Measures towards

Innovative Governments in 2020

Results from the EC-funded Project eGovRTD2020

SIXTH FRAMEWORK PROGRAMME

Information Society
Technologies

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http://www.egovrtd2020.org/

SIXTH FRAMEWORK PROGRAMME

Information Society
Technologies

To René Wagenaar, our Scholar and Friend.

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Project facts

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	Delft University of Technology, NL
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	University of Maribor, SI
	European Institute of Public Administration - CEFASS, IT
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Preface

Investing in the European ICT advancements is a major effort of the European Union to position itself and its Member States well in the global digital economy. While good results have been achieved to promote competition and investment in the telecom markets, ICT research investments in Europe are behind those of its competitors, e.g. only about half as much as in the US. Even more, investments and research in the European public sector's ICT infrastructures and ICT-enabled modernisation are comparably low.

The public sector holds a respectful share in contributing to economic growth and wealth of societies. Stability, health, education and security are among the service branches beyond the core administrative and democratic activities adding public value, and creating the right environment for innovation and prosperous economies. Yet, all these public sector service branches need to keep pace with innovation and technology developments as well, guaranteeing a lasting quality and provision of public services. The great potential of ICT to contribute to a competitive and wealthy economy needs to be exploited in public sector activities as well. Only through stronger investment in ICT research and effective innovation concepts can the public sector secure an innovative, knowledge-enabled, competitive and wealthy economy and society.

eGovernment is the use of information and communication technologies for better public services for citizens and businesses. eGovernment in the EU is supported through research, exchange of good practices and deployment of services. The key objective is to reap the benefits in the transformation of eGovernment. The objectives stated in the i2010 eGovernment Action Plan shall achieve this vision.

European IST research has been addressing major emerging challenges in the development of eGovernment services in the EU. A number of IST research activities from FP6 have paved the way for policy developments, helping Europe to exploit its strengths and to benefit from technological innovation. The i2010 eGovernment Action Plan, as mentioned below, plays a central role in advancing eGovernment solutions across the Member States.

It is in this context that European IST research on eGovernment was launched under the 6th Framework Programme. It was guided by two major objectives: the realisation of the European Research Area and

contributing to the Lisbon Strategy. The FP6 framework programme produced significant results and introduced interesting research topics that could be further explored in future research activities to be launched in the Competitive and Innovation Programme (CIP) from 2007 to 2013.

Instruments such as FP7 and in particular CIP, will capitalise on such results, continue to build on top of the outcomes of FP6 projects, expanding them and pushing them forward towards more advanced solutions and their effective adoptions.

Future eGovernment research will advance the borders of digital technologies for interoperable and efficient public sector organisations that offer user centric and secure services across Europe. At the same time, these activities will be a catalyst in a number of eGovernment policy developments and through that, to increase the scale and impact of eGovernment investment across Europe.

The European Commission's eGovernment Action Plan is an integral part of the i2010 initiative for jobs and growth in the Information society, which will make an important contribution to the Lisbon Agenda and other European Community policies.

The benefit of eGovernment projects in various EU countries has been rewarding. For example, electronic invoicing in Denmark saves taxpayers € 150 million and businesses € 50 million a year. If this was introduced around the EU, it would save up to € 50 Billion a year.

The five priority areas and objectives for 2010 addressed in the action plan, as outlined below, underline the commitment of the European Commission to delivering tangible benefits to all citizens, in cooperation with the Member States:

- No citizen left behind: eGovernment will only really make a difference if everyone can use it. The Commission will work with Member States to make sure that by 2010 all citizens, regardless of gender, age, nationality, income, or disability will have access to a wide range of technologies such as Digital TV, PCs and mobile phones.
- Raising efficiency: Public services concern everybody - all 470 million citizens in the EU, 20 million firms and tens of thousands of administrations. Governments account for 45% of EU GDP, which has to be paid from taxes. All Member States have undertaken to use ICT to achieve efficiency gains and reduce administrative burdens by 2010. Under the Action Plan, the Commission and the Member States will put in place a framework for benchmarking the impact of eGovernment in order get this process on track.

- Implementing eProcurement: Government procurement represents 15% of GDP or about € 1.500 billion a year. The Member States have committed to achieving 100% availability and at least 50% take-up of procurement online by 2010, with an estimated annual saving of € 40 billion. The action plan will lay out a road map for achieving these goals as well as the practical steps required for such large-scale cross-border procurement pilots and full electronic handling of company documents.
- Safe access to services EU-wide: When citizens travel or when they move they want easy access to services. EU governments have agreed to facilitate this process by establishing secure systems for mutual recognition of national electronic identities for public administration web-sites and services. The Action Plan foresees a full implementation by 2010. The Commission will help make this happen by supporting wide-scale cross-border demonstrators, identifying common specifications for electronic ID management during 2007 and by reviewing the rules of electronic signatures in 2009.
- Strengthening participation and democratic decision-making: 65% of respondents to the Commission's public consultation on eGovernment said that eParticipation can help reduce Europe's democratic deficit. The Action Plan proposes to support experiments in the use of ICT for more effective public participation in policy making.

The implementation of the eGovernment Action Plan relies on co-operation with the Member States and other stakeholders. At EU level, the Action Plan is supported by programmes such as IST for research, structural funds support for regional and local level projects, eTEN programme for the piloting and deployment of eServices. The Competitiveness and Innovation framework programme (CIP) / ICT Policy Support is funding these types of activities from 2007 onwards.

It is my great pleasure to provide the foreword to the book resulted from the eGovRTD2020 project. This book contains a large number of visions on the future of eGovernment in 2020 and presents stimulating research directions made up by researchers coming from all over Europe and beyond.

The project started in January 2006 and had a duration of 17 months. It was funded as a specific support action under the EC 6th Framework Programme of IST, Specific action Line 2.4.9: ICT research for innovative government. In total 9 academic organisations were involved in

this project. Seven of them are from the European Union, representing five European Union Member States. Two partners were from outside Europe, the Center for Technology in Government at the University of Albany in the USA and The Australian National University. In this way, consideration and investigation of future visions and a roadmap for eGovernment research span across the globe.

The European partners were funded by the 6th Framework Programme, whereas the non-European partners had to find other sources for funding. We would like to thank them especially for their interest in joining this project, contributing to the work and acquiring their own funding. In this way this roadmapping project has gone beyond the boundaries of Europe and has become a real international project. Consequently, the scenarios and roadmaps developed in this project represent regional differences in Europe, as well as differences between Europe, Australia and the USA.

The eGovernment roadmap project identified and characterised key research challenges, required constituency, and an implementation model for a comprehensive European initiative on holistic and dynamic governments in 2020. The underlying vision of this project is to transform the European Government landscape into a coherent community anticipating customer needs and leveraging the potential of the diversity and innovativeness of public agencies, and transforming the Union to the world leading knowledge society – contributing to the strategic aims of i2010 and the Lisbon Agenda.

Setting a roadmap for eGovernment research 2020 is a real challenge. Therefore some of the impressive amount of work done by the project partners should be stressed: In this project 18 regional workshops were conducted and in total about 480 experts were involved in workshops and online discussions. In seven regional scenario-building workshops across Europe and in the USA, 29 scenarios were generated, which were consolidated into eight comprehensive and distinct potential future images of governments in 2020. In the roadmapping workshops, another 340 participants were involved: 232 experts contributed to eleven regional roadmapping workshops, and 108 participants were registered and contributed to the online consultation. In a final round of consultation, 380 experts all over the globe assessed the importance of the 13 research themes brought up throughout the roadmapping activity of the project.

I also take this opportunity to thank the researchers who contributed to the work packages, the book, and for those who participated in the scenario-building and roadmapping workshops. The main results of this

project are originating from the workshops conducted, which required the intensive participation from experts coming from academia, ICT industry and consultancy, and different levels of governments. I would also like to thank all the experts for their availability and their valuable and active contributions throughout this project. Without their voluntary contribution and their high-quality ideas, this project could not have resulted in such a success.

This book promises to be the starting point for new research directions and can also be the inspiration to start changing your practices and anticipate future needs. The results are of high interest for researchers and policy makers and can be used by people working in the field of eGovernment. However, this book is also of interest for a much larger audience, including governmental officials, consultants, businessmen, and all other people interested in the multifaceted aspects of ICT and government. The book is written in such a way that it can be read by non-experts having limited expertise in either the field of technology or government, nevertheless, the book should also be of great interest to experts in this field. Some readers might only be interested in the future, whereas, others might only be interested in the gap analysis and roadmaps to shape their development and research efforts.

Once again, it is my pleasure to introduce you to this book, which provides new insight in the field of ICT and government, helps you to go beyond the traditional ways and views on eGovernment and supports the creation of a renewed research agenda in the field of technology for innovative government.

Enjoy reading!

Aniyan Varghese

Project officer of eGovRTD2020

European Commission

DG INFSO, eGovernment and CIP Operations

1. Introduction

Author: *Maria A. Wimmer*

1.1 Setting the stage: modern ICT in the public sector

New opportunities offered by the advent of the Information Society force not only the business sector, but also governments all over the world to improve their operations and become more efficient and effective. As a consequence, modern Information and Communication Technology (ICT) heavily impacts and shapes Government activities for cooperating and interacting with customers and stakeholders (i.e., society, citizens, businesses, citizen groups, NGOs and other government agencies within countries and across borders). For example, the use of ICT is expected to enable innovative performance of government business processes, integration of back-office systems throughout the public (and private) sector, and provision of fully customised and personalised electronic services to the different customers. The much-discussed concept of joined-up government services through one-stop-shops is a quintessential example of the positive results that can emerge from the affinity between ICT and public sector modernisation. Such initiatives provide more convenience, better quality, and reduced administrative burden on citizens and businesses.

Today, eGovernment has become a recognised research domain, as well as an established public policy area at both EU and Member States levels. A modernised ICT-enabled government is acknowledged as a key precondition in promoting the growth and competitiveness of the European knowledge society. When considered as a single entity, government is by far Europe's biggest economic sector: overall government spending across EU-15 amounted to about 49% of GDP in 2003 (EC Staff Working Paper, 2004) and affects all other sectors of the economy. Given this sheer size, it is increasingly evident that governmental efficiency results in important performance improvements and cost savings. Similarly, an increase in the efficiency and effectiveness of public sector management of the economy and society substantially reduces the administrative burden government imposes on businesses and citizens, which in European countries is particularly high. The first OECD study conducted in 2001 on this topic showed that the average cost of this burden on only the business branch in Europe is equal to 2% of GDP, and can reach as high as to 7% (OECD, 2001). Not surprisingly, scenarios presented within the EU-financed study eGEP (Funded under the MODINIS programme, see Codagnone and Boccardelli, 2006, Codagnone et al., 2006) predicted that between 2005 and 2010 eGovernment research and implementation programmes could boost EU's aggregated GDP by 1.54%, or by 166 billion Euros (Corsi et al., 2006 p. 15).

Given the strategic importance of eGovernment selectively underscored above, many EU Member States have revised their existing strategies for public sector modernisation and transformation of eGovernment to achieve some of the mentioned promises and to meet the objectives of EU strategies such as i2010 (European Commission, 2000, European Commission, 2002) and the Lisbon Strategy (European Council, 2000). However in most cases, these strategies and activities are only short- to mid-term oriented and do not fully take into account some of the critical issues that, if addressed through research, can become key enabling success factors. If overlooked, these issues will remain barriers preventing realisation of the promise of eGovernment.

In fact, despite the many potential benefits of using modern ICT, governments still

struggle with the problems of rigid and ineffective internal and inter-institutional process-es. Apart from that, a severe lack of understanding of citizens' real needs, attitudes and abilities to use ICT-based services also exists and this consequently leads to low take-up of online offers. Reasons for inefficient use of ICT include great heterogene-ity, fragmentation and inability of information systems to interoperate. Furthermore, business processes are not properly designed for effective implementation through modern ICT. Cooperation among government agencies and with society (citizens) and the market (businesses) is in most cases realised only in limited ways. Fully customized and personalised electronic public services are still a vision far beyond reality. However, electronic collaboration without the necessity of physical contact is clearly desirable for certain services in the public sector.

There is an increasingly urgent need to facilitate open discussion about the fu-ture strategic development of eGovernment and the public sector among European experts. The goal of such a discussion is to transform the European Government landscape into a coherent community, capable of anticipating customer needs and of making use of the available potentials of innovative ICT. Current deficiencies and challenges of eGovernment research in respect to potential futures of Governments, Society and ICT in 10 years and beyond must be identified and carefully investi-gated.

On the basis of existing challenges, deficiencies, and motivators, eGovernment is being discussed in many contexts, and from a variety of perspectives. Initiatives and activities have been launched by governments and institutions at all levels. They can be grouped into strategies, concrete implementation projects, as well as research activities.

The European Commission (henceforth EC) and the European Council have launched a number of strategic documents and initiatives to achieve more efficient government at a European scale. A key document is the Lisbon Strategy[1], whose main goal is to make Europe the most dynamic and competitive knowledge-based economy by 2010, improving citizens' quality of life, supporting single markets, and reducing administrative burden on enterprises. To achieve these goals, many oth-er strategic initiatives have been launched such as the i2010 initiative (European Commission, 2005b) and its predecessors eEurope 2005 (European Commission, 2002) and eEurope 2002 (European Commission, 2000).

These strategic documents grounded the thematic priorities of the 5th and 6th Framework Programmes of IST (Information Society Technologies)[2] of the European Commission. Within the 5th Framework Program, the EC funded eGovernment re-search and technology development projects related to a 'user-friendly information society'. Thematic priorities of the 6th Framework Programme were, among others, "ICT research for innovative Government" and "Strengthening the Integration of the ICT research effort in an Enlarged Europe". Other programmes related to the i2010 strategy and the eEurope Action Plans are, for example, the MODINIS programme (MODINIS, 2003), Interchange of Data (IDA) and Interoperable Delivery of Pan-European eGovernment Services to Public Administrations, Business and Citizens programmes (IDABC, 2005) and eTEN (Trans-European Networks) (eTen, 2007).

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1. See the official EU Summary *(http://europa.eu/scadplus/glossary/lisbon_strategy_en.htm)* and the Lisbon Strategy official website (http://ec.europa.eu/growthandjobs/index_en.htm)

2. http://europa.eu.int/comm/research/fp6/index_en.cfm

The European Commission initiated a great deal of research and pilot implementations related to eGovernment. Similarly, the National Science Foundation in America provides funding to spur innovation in digital government research. At the national level, funding mechanisms are also in place in Canada, Australia and New Zealand to advance eGovernment developments. European countries have started only recently to install national innovation programmes to advance eGovernment developments in research and implementation. Related initiatives and funding mechanisms exist to support focused eGovernment research and innovation in several European Member States such as UK, Italy, Germany, and Sweden. These mechanisms were launched in the course of 2006, or in early 2007. However, the state of play analysis of the eGovRTD2020 project (see chapter 3), which was performed in the first half of 2006 revealed that most national initiatives in eGovernment developments in Europe focus on ICT deployment and implementations without accompanying research.

Expectations of research and implementation in this field are very high. Yet, many investments have not met the visions and have failed in reaching the desired level of maturity. Consequently, two intertwined questions arise: What are the deficiencies of current developments in eGovernment? And what role will research play in advancing the field and filling the gaps?

In order to address these questions, the European Commission has funded a number of studies to investigate eGovernment research; among them a study conducted by the Danish Technological Institute (DTI) and the European Institute of Public Administration (EIPA) (cf. Millard et al., 2006), a study on "ICT-driven models of eGovernment" by *TNO and DTI*[3], a study by the *ICEG in Hungary*[4], a Coordination Action called *eGovernet*[5]. Gartner, a large ICT consulting firm, also performed a similar exercise of scenario-developments for eGovernment 2020 (Di Maio et al., 2005). Last but not least, these questions have been the focus of eGovRTD2020, the specific support action under the sixth framework programme of IST, whose key results are presented in this book.

1.2 Aims and overall approach of the eGovRTD2020 project

eGovRTD2020 was carried out from January 2006 until May 2007 and its results are summarised in this book titled *Roadmapping eGovernment Research: Visions and Measures towards Innovative Governments in 2020.*[6]

The overall aim of the project was to identify and characterise the key research challenges, required constituency, and possible implementation models for holistic and dynamic governments in Europe and around the world in 2020 and beyond. As both the project acronym and the book title include the concept of 'Roadmapping'

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3. TNO (The Netherlands) and DTI (Denmark). The future of eGovernment: An exploration of ICT-driven models of eGovernment for the EU in 2020. A study carried out for the Institute of Prospective Technological Studies, European Commission, DG JRC (final report to appear in 2007)

4. ICEG European Center (Hungary). Next steps in developing Information Society Services in the New Member States: The cases of eGovernment and eHealth. A study carried out for the Institute of Prospective Technological Studies, European Commission, DG JRC (final report to appear in 2007)

5. For more detailed information see the official website of the project: *http://www.egovernet.org/*

6. The full scope of the activities carried out, and the longer versions of the results can be found in the formal project deliverables publicly available for consultation at the project website: *http://www.egovrtd2020.org/*

it is important to elaborate on the specific and innovative approach we adopted for roadmapping (see more detailed discussion in section 2.4). eGovRTD2020 is a Policy-Oriented Science & Technology Roadmapping (henceforth POS&TRM), which substantially differs from more traditional Technology RoadMapping (henceforth TRM) which is usually characterised in the following ways:

a) As a forward-looking instrument supporting the development of new prod-ucts by highlighting the necessary steps to reach the market with the right products at the right time (referred to as product or corporate TRM); and/or

b) As an entire Industry exercise for sharing R&D investments and results of analysis and predictions in the pre-competitive domain, creating common technology standards and platforms and thus becoming more competitive in the long term (referred to as Industry TRM).

In both the corporate and industry version of TRM, one single desirable state of the future is envisaged and the exercise consists in finding the paths leading from the present to this desired future state. This approach can be labelled 'normative' and entails a more deterministic and less uncertain view of the future. Accordingly, the time horizon is relatively short, from 6 months up to 5 years depending on the sector.

As summarised here and discussed in depth in the next chapter, eGovernment by its very nature is a complex and multidisciplinary domain, involving the interaction and reciprocal conditioning of several different systems which cannot be treated as a simple industry and even less as a product. Accordingly, the approach chosen by the project partners is a holistic POS&TRM, whose vision of the future is certainly not normative and deterministic. It addresses broad societal challenges and is not limited to only technological considerations. Instead, it goes one step further to include fundamental and core scientific research. Taking this broader view, we have elaborated an innovative methodology combining both scenario-building and roadmapping techniques (see next chapter, section 2.4).

On this ground, the vision of eGovRTD2020 is to transform the EC government landscape into a coherent community, which anticipates customer needs and leverages the potential of the diversity and innovativeness of public agencies.

The overall project objectives are implemented by analysing the current state of play of the field and by developing future scenarios of governments using modern ICT in 2020 for service provision and interaction with constituencies (citizens, companies, other governments, etc.). Accordingly, investigations go beyond the next few years which are usually the target in traditional corporate or industry TRM or trend setting exercises. Instead, current research and longer-term future needs are synthesised, and gaps in current research are identified. On this basis, a number of themes for future research in eGovernment are derived, which comprise the actual roadmap. Measures and actions as well as key actors - in research, ICT industry, consulting, and governments – are defined for these themes. By putting the proposed measures into a timeline, a roadmap for future eGovernment research is constructed to streamline the activities and developments of the field towards an intended future. The roadmap defines measures to take in research, development, demonstration, implementation, promotion and training, assessment, and standardisation. With the identification and recommendation of these key steps, eGovRTD2020 contributes to the development of eGovernment research with the vision of the European Union becoming the world leading knowledge society. At the same time, the results offer a set of considerations whose salience is more global with substantial value for governments in many other parts of the world.
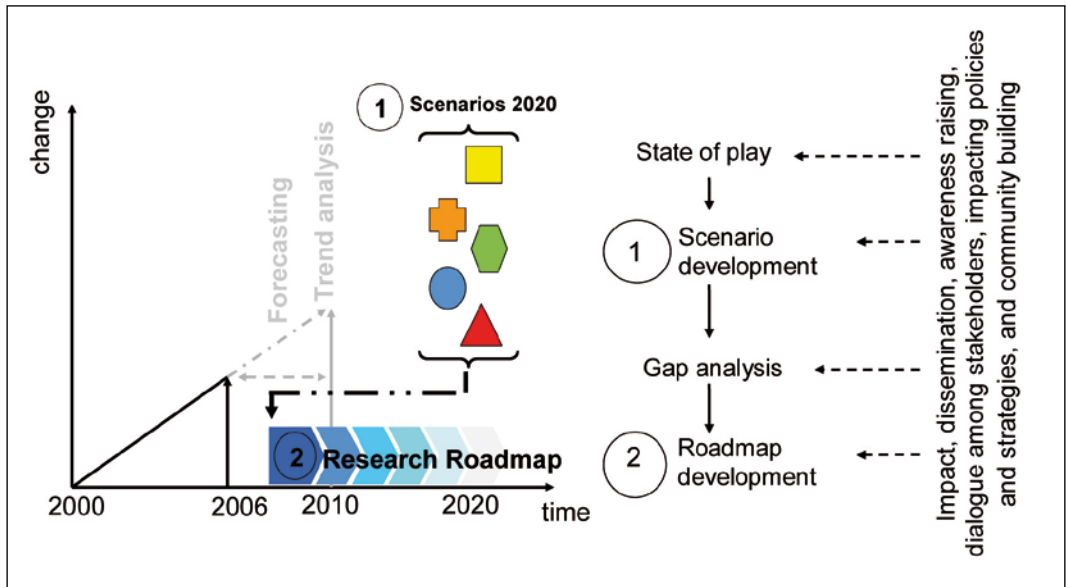
Figure 1: *eGovRTD2020 general methodology to develop an eGovernment research roadmap for innovative Governments in 2020*

eGovRTD2020's overall aims encompass the following specific challenges and drivers, which are also reflected in the general methodology depicted in Figure 1:

- Consolidation of paradigms, establishing a clear baseline and wide consensus on concepts and terminology for eGovernment research in the next 10 years and beyond. Since collaboration of different agencies at all government levels is a rather difficult process, proper planning and clear identification of the actors and their potential roles are crucial.
- Planning the integration of multidisciplinary views into a holistic vision for eGovernment research and technology development (RTD) to reach the visions of 2020. A growing awareness and consensus exists that eGovernment is multidisciplinary in nature. Consequently, ICT developments, socio-economic adaptations, organisational changes, business process reengineering, legal and security compliance, as well as political, cultural and ethical peculiarities need to be considered in parallel when implementing eGovernment systems.
- Creating scenarios of eGovernment in about 15 years from now, including positive and negative images, thereby identifying key research questions and development needs. Based on a holistic consideration, images of future of government activity and service provision are developed, which rest on advanced ICT, reach an intended level of effectiveness, and create public value. Key aspects and topics of interest characterising these images are extracted from the scenarios and assessed in terms of impact on current government activity and their likelihood of becoming reality.
- Identifying and articulating gaps and challenges of key elements of current research vs. needs based on future scenarios (both positive/wanted and negative/unwanted), which have to be addressed in future eGovernment research.
- Rationalising the identified challenges and needs towards focused research themes accompanied with a set of measures to implement the research in a reasonable

timeframe. The roadmap for eGovernment research covers 13 research themes, and proposes research actions assigned to specific actors which should implement the research in a given timeframe.

- Putting the results of this project into a wider perspective, thereby arguing the importance of research in this field, and consequences if research is not carried out.
- Strengthening the eGovernment community to implement the roadmap. The results of eGovRTD2020 are especially targeted for the EC (and other national and international research sponsors such as e.g. the US National Science Foundation) to help shape future investments in eGovernment research.

1.3 Core terminology within the project

For a consistent understanding, the eGovRTD2020 consortium has agreed upon the following terms commonly used in the course of this work[7]:

A *scenario* is an internally consistent and coherent sketch of a future vision of eGovernment.

Issues are aspects/elements in a scenario. A scenario combines various aspects/elements of a future vision of eGovernment. An issue can be either a dimension or topic of interest.

A *dimension* is a variable which can be expressed as two opposing extremes in the future of eGovernment in 2020 and is a particular type of issue. For example, in the dimension "trust in government," one extreme is distrust in government and the other extreme is high trust in government. Only dimensions having a high impact on eGovernment in 2020 are considered. A dimension has at least two opposing topics, (i.e. denoting the extremes) and can contain further topics along the scale.

Topic of Interest: topics are single points along a dimension and are a particular type of issue. One topic of interest can belong to more than one dimension. For example, the trust dimension can contain certification authority as a topic of interest. Certification authority can also belong to the security dimension.

A *category* refers to a cluster or group of similar dimensions leading to a more holistic understanding of eGovernment. As such, categories denote a domain or interactions between domains of the holistic framework of eGovernment.

A *gap* is defined as a mismatch between the issues (dimensions or topic of interest) in the state of play and future scenarios, or a lack of recognition of issues that are not in the state of play but required in the future scenario.

Gap storylines are a coherent collection of issues (dimensions and topics of interest) within one category including a problem (a gap), a goal, and potential solutions in the future. Gap storylines may enlarge issues identified in the scenarios with new aspects to make them internally complete and consistent.

A roadmap is a collection of paths describing a set of themes and measures to achieve desirable parts of the future and to avoid unwanted parts. The roadmap is based on categories and dimensions, extracted from the scenarios, and on the gaps ranked as highly relevant in the gap analysis. The categories and dimensions from the scenarios may correspond to the eGovernment research themes.

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7.   The terminology was jointly elaborated by the eGovRTD2020 project consortium members, which are listed in the List of authors on p. 193.

1.4 Key results and main stakeholders addressed

The book at hand documents the main contributions of the eGovRTD2020 project. Key results can be summarized as:

- *A comprehensive methodology*: a structured approach for strategic planning based on a holistic view of the field under consideration, including a scenario-building technique for the development of visionary scenarios reaching beyond traditional forecasting and trend analyses, a method for gap analysis of strategic aspects in research, and a technique and roadmap schema to define a range of specific thematic actions and actors to reach a target.
- *A number of visionary scenarios*: In the scenario-building phase, intense interaction with key stakeholders of eGovernment was carried out to develop visionary scenarios of how governments might look in 2020. In six regional workshops in Europe and one in the US, 29 scenarios were developed by 141 participants to describe images of how the public sector might use advanced ICT to interact with its constituency about 15 years from now.. These were synthesised and reduced to a set of eight scenarios to communicate the main features of these future visions to expert stakeholders and policy level decision-makers.
- *Thirteen research themes*, *with associated actions for target stakeholders, phased in a timescale from now till 2020 (the roadmap)*: The roadmapping exercise also engaged experts in the field through 11 regional workshops which derived thirteen major research themes from the visionary scenarios and the current gaps in eGovernment research. Actions and key actors to implement these research themes were placed in a timeline resulting in associated roadmaps for future eGovernment research.

In the course of the project, active contributions were made by 481 experts[8], including 97 from governments, 121 from ICT industry and consulting, 1 from politics, and 262 researchers. Their participation took place in the regional scenario-building and roadmapping workshops, as well as in an online consultation. A final online survey to prioritise the research themes was completed by 380 experts (88 from government, 57 from ICT industry and consulting, and 233 researchers). The geographic distribution of all 861 participating experts is shown in Figure 2.
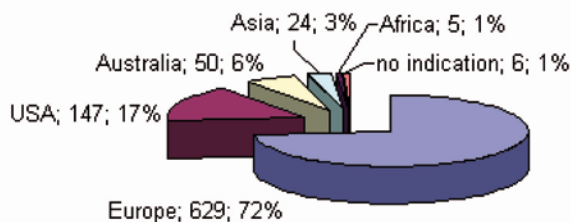
Figure 2: *Geographical distribution of participants through a number of interaction means (workshops and online; N=861)*

8. The effective number of individuals reached is approximately 320, because 1/3 contributed in two or several ways (scenario-building, roadmapping, online consultation).

Throughout the project, the eGovRTD2020 consortium interacted intensively with stakeholders and potential recipients of the project results, continuously raising awareness that further research in this field is urgently needed and that all types of stakeholders need take action in order to realise the desired future visions.

The results of the eGovRTD2020 project reported in this book[9] provide a baseline of argumentation for strategic decision-makers in government, politics, and the ICT industry and consulting to direct research efforts towards important new challenges. The project results offer several future visions and concrete eGovernment research actions linked to advanced solutions in this field. The project results discuss emerging problems and trends such as socio-demographic change; natural, economic, and virtual crises; trust in Government; participation across public, private, and civic sectors; innovation and modernisation; and virtual world orders. All of these help build a baseline for the next calls of the 7th Framework Programme of the European Commission with respect to eGovernment research themes and priorities. They also provide a guide for national research programmes to support innovative RTD for public sector responsibilities and to spur innovation emerging from within the public sector in order to contribute to a highly innovative knowledge society.

1.5 Outline of the book

The book is organised in three parts reporting the results of the eGovRTD2020 project on strategic planning of future eGovernment research:
- Theory and methodology (chapter 2);
- Main results, including the scenarios, gap storylines, and the roadmap (chapters 3 – 6);
- Reflection on the results from a wider perspective and recommendations for strategic decision-makers to invest in eGovernment research in order to encourage future development and evolution in the public sector based on the exploitation of innovative emerging technologies (chapters 7 and 8).

Chapter 2 introduces main definitions, key concepts, and the basic underlying methodological principles used in the project. First, a set of definitions for eGovernment is provided, followed by key concepts used throughout the project (e.g. scenario, dimension, roadmap etc.). eGovernment is then presented as a multidisciplinary research field which provides an underlying holistic framework for the project. Subsequently, we describe the methodologies to analyse the state of play, to develop the visionary scenarios, to analyse gaps and challenges of current research, and to extract research themes into a roadmap of phased actions.

Chapter 3, reports the results of the state of play analysis of current eGovernment research and strategies collected and summarised through extensive desk research. It covers the main research programmes, research strategies and eGovernment research projects in Europe and around the world.

Next, future scenarios of innovative Governments in 2020 are reported. These were developed in six focused regional workshops in Europe and one in the US. Experts from governments, ICT industry and consulting, as well as from research institutions were consulted to develop different visions of governments in 2020. The scenarios describe in a holistic way images of how governments might use innovative ICTs 15 years from now

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9.   Full reports of results are available online at http://www.egovrtd2020.org/

to interact with other governments and with society and the market to carry out their duties and create public value. These 29 scenarios were consolidated and synthesised into a final set of eight scenarios which are reported in chapter 4.

The gap analysis extracted differences between the state of play of eGovernment research and future needs for eGovernment research as indicated by the 2020 scenarios.. This analysis investigated problems, weaknesses and aspects of the future which need further investigation in current research or need to be the subject of research not yet undertaken. The gaps are described in terms of problem scope, weaknesses and needs and are elaborated in gap storylines which highlight the deficiencies and challenges with arguments about the likely consequences, risks and potential threats that may emerge if they are ignored. The results are reported in chapter 5.

Chapter 6 describes the process and results of efforts to formulate future eGovernment research themes and actions. Eleven workshops were conducted with the participation of 188 experts from Governments, ICT industry and consulting, as well as researchers, in addition to an online consultation 108 experts. Altogether the roadmapping consultation comprised a validation of scenarios and gaps[10], and discussion and definition of research themes and associated research actions, actors, and timelines. The themes, actions, actors and time frame to implement the research were validated and synthesised in two validation workshops to extract thirteen final research themes for the eGovRTD2020 roadmap.

The subsequent chapter 7 puts the results of chapters 3 to 6 into a wider perspective. It brings in a line of argumentation on the importance of the findings and the international relevance of the project results.

Chapter 8 leaves the space of a neutral argumentation and reflects on the research themes in the context of the EU strategic policies relevant for. Action recommendations related to the proposed research are presented for strategic decision-makers in governments, politics, ICT industry and consulting to adopt research activities that will contribute directly to the achievement of EU policy goals.

We sum up in Chapter 9 with concluding remarks on the work performed throughout the eGovRTD2020 project, and briefly reflect on the key findings and recommendations.

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10. The validation of scenarios and gaps leaded to the respective results documented in chapters 4 and 5.

2. Framework and methodology

2.1 Definitions for eGovernment
Authors: *Maria A. Wimmer and Cristiano Codagnone*

For some time now, initiatives and activities in the context of eGovernment have investigated the usage of ICT in the public sector and in different sector-specific implementations. Many definitions have emerged which express the breadth and depth of the field. A selective sample is provided in the following:

- Gartner Group (2000): The continuous optimisation of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the Internet, and new media.
- European Information Technology Observatory (European Information Technology Observatory (EITO), 2002, p. 288): eGovernment is defined as the use of Internet technologies to conduct, enhance and support relations with, and transactions between, different government bodies and citizens, businesses and other government bodies.
- OECD[11]: The use of information and communication technologies, and particularly the Internet, as a tool to achieve better government.
- Pacific Council on International Policy, Working Group on eGovernment in the Developing World[12]: eGovernment is the use of ICT to promote more efficient and effective government, facilitate more accessible government services, allow greater public access to information, and make government more accountable to citizens. eGovernment might involve delivering services via the Internet, telephone, community centres (self-service or facilitated by others), wireless devices or other communications systems.
- United Nations[13]: eGovernment is defined as utilising the Internet and the world-wide-web for delivering government information and services to citizens.
- World Bank[14]: eGovernment refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.

Similar definitions with a rather general scope of eGovernment being the topic of using ICT in the public sector in order to provide public services online are given in (Lenk and Traunmüller, 1999, Schedler et al., 2003, Tambouris and Wimmer, 2004). A comprehensive definition of the scope and processes covered by eGovernment is formulated in (Lucke and Reinermann, 2003). The European Commission (European Commission, 2003, p.7) defined eGovernment as "*the use of information and communication technologies in public administration combined with organisational change and new skills in order to improve*

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11. See http://webdomino1.oecd.org/COMNET/PUM/egovproweb.nsf/viewHtml/index/$FILE/e_gov_project.htm
12. See http://www.pacificcouncil.org
13. See http://www.unpan.org
14. See http://www1.worldbank.org/publicsector/egov/definition.htm

public services and democratic processes and to strengthen support to public policies".

Another broad definition was developed in the German Memorandum for eGovernment (Fachausschuss Verwaltungsinformatik, 2000, p. 3): "*Electronic government refers [...] to the implementation of processes of public participation, decision-making, and service provision in politics, government and administration with an intense usage of ICT. [...] This definition includes [...] a series of administrative and management processes as well as processes of political and financial controlling*". Already in 2000, the authors of the Memorandum stressed the need of eGovernment research to accompany modernisation of the public sector in two ways:

- Through the development of methods and techniques to design eGovernment; and
- Through studies that assess the success and impact of implementing eGovernment.

The definitions of the Pacific Council on International Policy, of World Bank, the European commission and the German Memorandum for eGovernment embody the crucial aspects of eGovernment, which were the underlying points of consideration and investigation throughout the activities of eGovRTD2020. These definitions comprehensively communicate the understanding of the term eGovernment as used throughout the project.

Another factor to take into consideration when setting the scope of investigation and the complexity of the field is the following: When reflecting the definitions given, one needs to bear in mind that distinct constitutional settings and administrative cultures and traditions shape the governing of the public sector throughout Europe and worldwide. These cultures, traditions and structural settings impact the way governments act and interact with their constituency. Because of the European and international scope of the project and as a result of the methodology chosen (interaction with experts in regional workshops), such context-specific peculiarities may have led to regional differences in the visionary scenarios and priorities of future eGovernment research foci. They made analysis and synthesis of work in eGovRTD2020 more difficult and complex. When such regional differences emerged, they were analysed and studied such as for instance particularly at the end of the scenario and roadmapping chapters (4 and 6).

2.2 eGovernment as a multidisciplinary research field
Author: *Maria A. Wimmer*

Tackling eGovernment as a research discipline, one needs to understand its many facets. Several years ago, Wimmer (2002) has developed a framework for integrating various perspectives of eGovernment. The approach covered and integrated findings from different disciplines of research such as public administration sciences, computer sciences, economics and public governance, jurisprudence, social and socio-technological sciences, etc. The aim was to understand the inter-linkages of eGovernment specific topics. Only with such a comprehensive understanding of the various aspects of ICT usage in the public sector it is possible to analyse eGovernment developments taking into account a broad set of requirements.

Putting the discussion on a meta-level, eGovernment is to be seen as a field of applied research. It has links to many well established disciplines of research (see Figure 3). Some of these fields of scientific research are (cf. Wimmer, 2007):

- *Social and human sciences*: Research in this field provides a deeper and more articulated definition of users by focussing on a variety of stakeholders and institutional aspects, as well as by looking at motivational aspects. Social, economic and psycho-

logical sciences investigate these themes. Issues researched here are e.g. how users interact with governments, how governments can establish a better and more trust-based relationship with their constituencies, and how employees interact within their organisations and across organisational boundaries. The interaction between the introduction of ICT in the public sector and issues of social exclusion/inclusion are also typical of sociological approaches. Socio-economic studies analyse the economic and social impacts that technology can produce.

- *Political, strategic, democracy, and legal sciences*: These are concerned with the impact of ICT-usage in the course of decision-making, be it at political, strategic or governance level. Furthermore, this area investigates issues of ICT-supported democracy and direct participation of citizens, and supporting elected representatives in democratic decision-making through ICT. ePolicies and eGovernance (also shaped in the organisational and economics research) are catchwords indicating aspects of eGovernment research in these sciences. Recently re-activated topics are the support of social networks as a means to freeing the individual from traditional networks of influence (family, friends, co-workers and neighbours) or a democratic interaction fostered via an active 'marketplace of ideas'. Co-governance between state institutions and civic actors, civic networks and creative commons models to facilitate concrete community involvement are yet other areas of investigation in this research field.

- *Information and knowledge research sciences*: The public sector is dealing with information and knowledge at large. It is just natural that research investigates how such large information and knowledge resources may be managed effectively and efficiently within the scope of transparency, trust, privacy, and in compliance with the laws. The specific research attention in the field was spurred by new findings in semantic web and ontology research from artificial intelligence and computer science. Since the public sector deals with information and knowledge at large, and because information overload becomes an ever more critical challenge, eGovernment users may ask for intelligent search and retrieval mechanisms, proper mining technologies especially in large data repositories, as well as for effective information logistics, i.e. having access to the right information in the right quality when needed. Because the users in eGovernment are very heterogeneous, different means of search and visualisation of information and knowledge are studied by respective disciplines. Apart from that, the eGovernment research community is investigating intelligent content and knowledge sharing mechanisms, application of intelligent agents and comprehensive one-stop accessibility of dispersed knowledge resources. Aim is to provide intelligent and ubiquitous support systems for decision making, collaborative argument visualisation, eServices provision, employee knowledge portals, policy discussions, citizen participation in democratic matters, etc.

- *Organisational and economic sciences*: This area develops concepts of most effective and efficient organisational and governance structures in the public sector. Concepts and studies foster networked governments, public-public, public-private and public-private-civic partnerships and their effects on productivity, efficiency and compliance to laws. Keywords in this research area are e.g. good governance, better governance, new public management, modernising governments, accountability, transparency, quality of service or public value generation. Also the area of monitoring and benchmarking can be assigned to this domain of research.

- *Computer sciences*: This area is concerned with concepts and solutions for the ICT implementations for eGovernment. Examples of research aspects are interoperability

between bureaucratic systems as a whole and across regional and national borders; tools and services for public service provision at large without any media breaks and by means of various communication channels; electronic identification, encryption and digital signatures; electronic payment, etc.
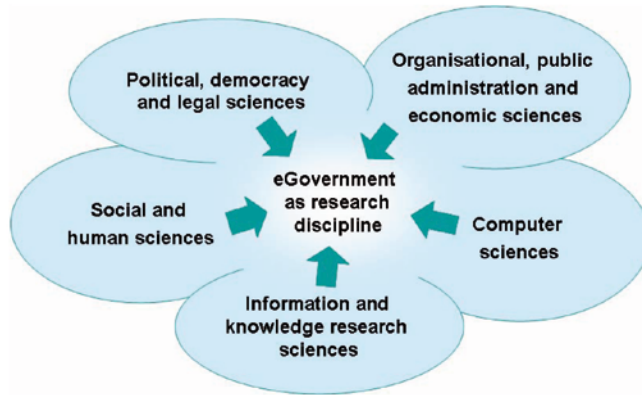
Figure 3: *Multidisciplinary and integrative role of eGovernment as a research discipline*

The specifics of eGovernment as a research field are that this area requires competencies of different disciplines to bring forward innovation and solutions. Moreover, the challenge is to transcend one's own discipline towards investigating and comprehensively analysing and designing the interplay of the many aspects of eGovernment in a holistic way as a socio-technical system (see also section 2.3).

With the view of eGovernment research being trans-disciplinary and integrative, such research can contribute to the overall development and innovativeness of the public sector in various ways such as (Wimmer, 2007):

- Putting in place innovative solutions that can be deployed in the public sector in various areas;
- Driving innovative solutions to the field of application (new technologies to be applied to the public sector);
- Taking up the needs of the public sector and investigate new concepts, frameworks and solutions;
- Being the forerunner/pilots of solutions for the public sector;
- Carrying out studies and analyses of the field and its complex interdependency factors, thereby securing objectivity from specific interests from within a context;
- Contributing to international standardisation and integration efforts;
- Transferring knowledge and skills to the ICT-sector and governmental application fields;

These are only a few examples of where and how eGovernment research can contribute to government modernisation and innovation, and further on to growth and innovation in society.

2.3 Holistic framework for eGovRTD2020 investigations
Author: *Maria A. Wimmer*

Applying a holistic approach for designing socio-technical systems is becoming more and more important (Wimmer, 2000, p. 148). Socio-technical system in the context of eGovern-

ment refers to considering public administration made up of people (the social system) using tools, techniques and knowledge (the technical system) to produce public services valued by the governments' constituency (external to the public administration). Complex interactive systems such as those being deployed in eGovernment contexts are formed by a multitude of aspects. Current scientific discussions converge in considering eGovernment as multidisciplinary in nature (see e.g. Scholl, 2006). As quoted earlier, Wimmer for instance has developed and published a holistic reference model for developing eGovernment (Wimmer, 2002). Her concept stresses the need for comprehensively considering eGovernment as socio-technical systems from the following perspectives: technology, economics, organisation, processes, legal grounding, social factors and culture, security, politics and ethics.

A number of research questions emerge from studying especially the interaction among the four key elements of government activity as depicted in Figure 4 (see also the different research disciplines investigating eGovernment as introduced in section 2.2):

1) Government modernisation research, including organisational change, networked governments, legal groundings, new government business models such as lean government, new public management, public-private-civic partnerships, customer orientation, eSkills required by Government users, etc.
2) Research in society evolution, demographic changes, people using ICT as a daily support tool, people refusing or being unable to use ICT, people expecting governments to serve in traditional mode, problems of societal change such as digital divide, ICT-illiteracy, ICT-addiction, cyber crimes, emergencies and disasters, etc.
3) ICT-related research, including new and innovative technologies in future eGovernment and eParticipation applications.
4) Research in effectiveness, efficiency and economic values in Government modernisation based on ICT-diffusion, including public value of new ICT- tools and technologies and cost/benefit assessments.
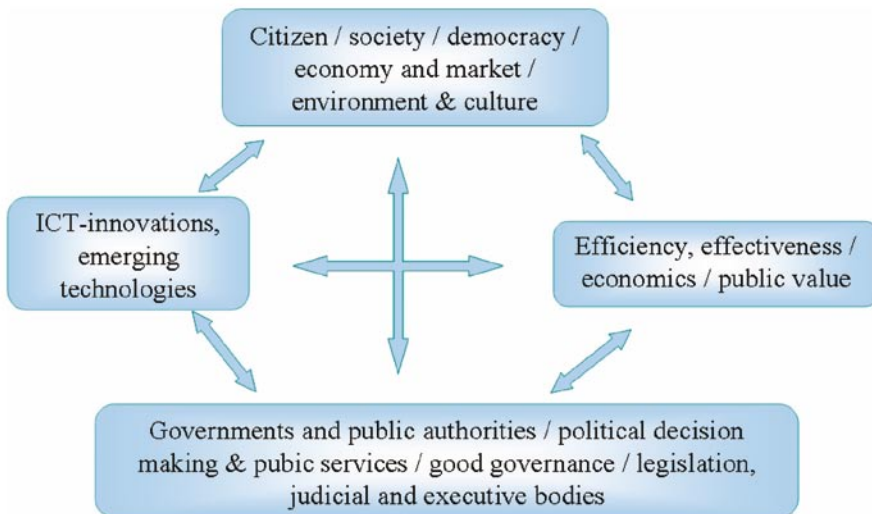
Figure 4: *Holistic reference framework of eGovRTD2020 – key elements of government activity and their interrelationships*

The arrows in Figure 4 stress that the four core elements under consideration cannot be studied in isolation. Instead, interaction among them and the strong interrelationships are of particular interest in eGovernment research. Just to exemplify one relation: eGovernment success is shaped by the interrelation of how Governments use ICT in order to provide public services to citizens and thereby reaching certain performance criteria such as public value, effectiveness, quality of service, cost savings at the administrative side, etc. One could make a long list of such relationships indicating the multidisciplinary nature of eGovernment.

Digging further into these interrelationships thereby exploring the particularities of the interactions is a means to gather a proper understanding of the socio-technical nature of eGovernment and its contextual environment. Within eGovRTD2020, the holistic reference framework was used to group and cluster the many topics of interest and issues elicited in the state of play, scenario-building, and gap analysis. The elements of government activities as described earlier were directly mapped into four main categories: Government, ICT, Society, and Economics. The interrelations of these four main elements resulted in further seven categories[15]:

5) Government & ICT: how do governmental institutions use ICT for their activities and services, both internally and for their inter-governmental interactions.
6) Governments & Society: how do governments interact with society, i.e. services to the society, citizen integration, customer orientation, people expecting governments to continue to serve in traditional mode instead of in online mode, etc.
7) Government & Economics: how do governments fulfil their tasks in an effective and efficient way, securing value for money, carrying out cost/benefit analyses, doing modernisation based on pressure to save costs, etc.
8) Society & ICT: people using ICT as a daily support tool, people rejecting ICT, problems of societal change in relation to ICT usage such as digital divide, ICT-illiteracy, ICT-addiction, etc.
9) Government & Economics & ICT: how do governments reach more efficiency and effectiveness through the use of ICT; modernisation through ICT based on economic drivers; focus of modernisation and economic consideration is within and among governments.
10) Governments & Society & Economics: how do governments reach more efficiency and effectiveness in interacting with their constituency through organisational change and modernisation; this category focuses on efficiency gains in interacting with the constituency without using ICT.
11) Government & Society & ICT & Economics: how do governments reach more efficiency and effectiveness, and implement public value through modernising their interaction with their constituency via extensive usage of ICT.

The focus of eGovRTD2020 is on eGovernment research and future research themes in this field. Consequently, some categories have been more important (e.g. the last item listed) than others and, hence, have been embodied in other related categories (e.g. topics of interest of the category Society & ICT were assigned to the respective single categories or to the category Government & Society & ICT, if any government aspect could be identified).

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15. Categories are built on the principle to consider each combination of elements (pair-wise: 3+2+1; triples: 2+1; quadruple: 1). However, the category ICT & Society & Economics was omitted because it seemed not to add value to eGovernment research, since the category ICT & Society already covered potential issues (i.e. the Economics element was of no further interest in ICT & Society in the context of eGovRTD2020).

2.4 Holistic and policy-oriented approach to roadmapping
Author: *Cristiano Codagnone*

Having illustrated the multidisciplinary nature of eGovernment and the holistic framework inspiring the work of eGovRTD2020, the specificity of the roadmapping approach is discussed next. We anticipated in the previous chapter (section 1.2) that eGovRTD2020 uses a Policy Oriented Science & Technology RoadMapping (POS&TRM), which differs from the more common product and industry Technology RoadMapping (TRM).

In eGovRTD2020, the roadmapping activity came logically after the state of play, the scenarios, and the gap analysis. Roadmapping thereby built on these results of previous activities, leading subsequently to the final output of the project: the roadmap with a number of research themes and actions for targeted actors sketched in a particular timeframe. The same order shapes the structure of this book.

In this section, a general thematic discussion on roadmapping is provided before illustrating the methodology used for the other steps. For two reasons: First, because the research roadmap was the intended final result and is directly related to the holistic framework described earlier. The close relation between the holistic framework and the roadmapping approach, thus, shapes also the way the intermediate steps have been carried out and, in particular, the choice of integrating both scenario-building and roadmapping techniques. Second, as the concept of roadmapping is more frequently associated with its product and industry usage, we deemed important to clarify at an early stage to the reader that the eGovRTD2020 roadmap substantially differs from traditional technology roadmapping.

While this section provides the broad characterisation of the roadmapping approach, the operational methodology adopted to implement it is presented in section 2.8 (after describing the methodological details of the preceding phases of state of play analysis, scenario-building, and gap analysis).

Technology roadmapping (TRM) has become a widely used approach by both individual companies, entire industries in the past decade (Kurokawa and Meyer, 2003, McCarthy, 2003, Probert and Shehabuddeen, 1999). The use of the term "roadmap" conveys the main purpose of this approach, namely to chart an overall direction for technology development or usage (MacKenzie et al., 2002, Grossman, 2004). In the most traditional sense, TRM aims at supporting the development of new products by establishing causal or temporal relations between the technological possibilities and choices and the business objectives thereby highlighting the necessary steps to reach the market with the right products at the right time (Groenveld, 1997). Robert Galvin, former Motorola chairman and advocate of Science and Technology roadmaps, defines a roadmap as "*an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drivers of change in that field. Roadmaps communicate visions, attract resources from business and government, stimulate investigations, and monitor progress. They become the inventory of possibilities for a particular field.*" (Galvin, 1998). A technology roadmap provides a consensus of a view or vision of the future Science and Technology (S&T) landscape available to decision makers (Kostoff and Schaller, 2001).

In a broader perspective, technology roadmapping can be seen as a tool for Research & Development Portfolio Management, providing forward-looking insights for linking the allocation of resources (investments or financing decisions) to strategic goals in an increasingly complex and fast changing environment, which the roadmap attempts to make more intelligible. Indeed roadmapping is gradually developing into a new discipline as numerous studies have been devoted to the theory and methodology of roadmapping (see for

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Xiaofeng Ma, Andreja Pucihar, Patrick van der Duin, Maria A. Wimmer

instance:(Grossman, 2004, Boden, 1992, Dierkes et al., 1996, Radnor and Probert, 2004, Probert et al., 2003, Strauss and Radnor, 2004). Yet, in spite of the growing interest in road-mapping and the theoretical and methodological attempts to structure the corresponding process, there is not yet a real systematic roadmapping approach or even visioning methodology defined. In short, it can be said that the practises of TRM are diverse and that such methodologies have yet to reach maturity. TRM is still developing from an art to a discipline, from exploring a spectrum of methodologies for different goals and situations into systematically applying basic principles and methods (Eggermont, 2003). A standard definition of technology roadmapping and systematic roadmapping approach does not exist (Albright, 2002), and an examination of roadmaps that have been created indicates that there is considerable diversity among practitioners as to what constitutes a roadmap and the roadmapping techniques employed (Rocket_WP2_Partners, 2002).

Table 1 is an attempt to develop a typology of roadmapping approaches looking at a number of dimensions that enable the identification of three different types of TRM.

Product or corporate TMR has been developing since the 1980s within R&D and strategic planning teams in high-tech companies (Willyard and McClees, 1987). It is a forward-looking instrument used to support the development of new products by highlighting the necessary steps to reach the market with the right products at the right time (Groenveld, 1997). In the case of corporate roadmapping, the goals are relatively easily defined (Da Costa et al., 2003). They are about optimising R&D decisions and strategic planning for development of new products or more generally delivering the right products on the right market at the right time.

Table 1: *Three categories of roadmapping*

	Corporate TRM	Industry TRM	Policy S&TRM
Diffusion	**mit-1980s**	**early 1990s**	**Late 1990s**
Scope	One product or a family of products	A technological sector (mono-disciplinary)	Wide S&T areas or whole S&T landscape seen from an "issue-driven" approach and extended upstream to fundamental scientific research
Objectives	Optimising R&D decisions, strategic planning for development of new products	Becoming more competitive by sharing R&D investments and results in the pre-competitive domain	Providing the intelligence needed for optimising public R&D investments and ensuring their relevance to society
Methodology	Compilation of technical documentation, internal workshops	Workshops with industrial and academic experts	Workshops with various experts and stakeholders, large scale semi-public or public conferences
Approach to the future	Technology-driven and/or market-pull; Descriptive and normative: "what are we going to do?"	Technology-driven Forecasting and normative: "what will happen?" and "what we should do?"	Problem-driven (also technology-driven) Proactive, today's policies contribute to shape the future, "the future depends on us", multiple possible futures
Time Horizon	Short term, typically 5 years	Medium term, typically 5 to 10 years	Typically 15 to 25 years, connecting long-term socio-economic issues (e.g. demographics, geopolitics, societal concerns and demands, etc.) to shorter-term foreseeable technological developments

The concept of Corporate TRM has been extended to develop *Industry TRM*s, involving consortia of companies or even entire industrial sectors. The fundamental idea is that an entire industry becomes more competitive in the long term by sharing R&D investments and resulting in the pre-competitive domain, where common technology standards and platforms are created thereby sharing risks and avoiding duplication of efforts. A typical example is the US-based 'National Technology Roadmap for Semiconductors' (NTRS), first developed in 1992. It has since evolved into a world-wide collective reference document for the semiconductor industry, i.e. 'The International Technology Roadmap for Semiconductors', first published in 1999. Equally noteworthy is the Technology Roadmapping Initiative launched in 1995 by Industry Canada as part of its strategic plan to support Canadian innovation. Since then, government, private companies, researchers and others have come together in roadmapping projects. Along with government, more than 400 industry representatives (from 220 companies) and some 50 non-industry people (from universities, research institutes and associations) have worked to produce technology roadmaps[16].

In both the corporate and industry version of TRM, one single desirable state of the future is envisaged and the exercise consists in finding the paths leading from the present to this state. This approach can be labelled 'normative'. Accordingly, the time horizon is relatively short, from 6 months up to 5 years depending on the sector.

Since the mid-1990s, various trans-disciplinary think-tanks or public agencies have sought to adapt TRM methodologies to the process of policy-making in areas where S&T plays a prominent role (Cahill and Scapolo, 1999, Da Costa et al., 2003). In this endeavour a prominent role has been played by the Seville based Institute for Prospective Technology Studies (IPTS) of the EC' Joint Research Center (JRC) network (see for instance (Braun et al., 2003, Friedewald and Da Costa, 2003)).

The main objective of such Policy-Oriented Science&Technology RoadMapping (POS&TRM) is to provide the strategic intelligence needed by policymakers to optimise public R&D investments and to ensure their relevance to society. So POS&TRM can be seen as an instrument supporting Portfolio Management and Planning of public investments in R&D. In public funded research usually the overall programme of funding must look beyond the perspective of a single product or a single industry as it must by its institutional mission ensure that the public money invested is used to help respond to challenges that are relevant to society as a whole. If we look, for instance, at the history of the EU IST Framework Programmes (IV, V, and VI) the priorities of scientific and technological R&D has always been shaped by wider societal challenges. When looking at the future, R&D needs to address such challenges.

When roadmapping eGovernment research programmes, the focus of the roadmapping exercise can neither be that of a single technological product nor of a single ICT industry. It must be a holistic look at a dynamic and open socio-technical system. This means that a comprehensive approach must take into consideration technological developments and the corresponding industries, whilst also investigating the broad socio-cultural and socio-economic trends, including in-depth analysis of the demand side (users needs, resistance, cultural barriers) as well as of the practitioners side (due analysis of the political, institutional and regulatory dimensions - cf. holistic approach as introduced in sections 2.2 and 2.3). Therefore, POS&TRM as such, if compared to corporate or industry TRM, differs in that:

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16. See *http://strategis.ic.gc.ca/epic/site/trm-crt.nsf/en/Home* for the various roadmaps and methodological tools produced by Industry Canada. A specific and interesting example is the roadmap methodology produced by the Defence Industry *(see http://www.strategis.gc.ca/epic/site/ad-ad.nsf/en/ad03120e.html).*

a) Its scope is defined by far reaching societal 'challenges' rather than a technological product or industry per se; hence
b) The scope is larger as it must move further upstream beyond technological developments into fundamental scientific multidisciplinary research (technological, social, cultural, political, legal, etc.) in order to envisage the potential future applications; and
c) To optimise public R&D investments and ensure their relevance to society they must encompass the economic, political and social dimensions, and the complex interactions between them.

It is essential that the policy intelligence roadmap is centred on some of the major challenges society is facing rather than only pushed by technology and the technology developers. Therefore the 'challenge(s)' and the human factors are key: economic, social, human and demographic dimensions have to be intrinsic to the roadmapping process.

POS&TRM is an exploratory and heuristic tool to anticipate long term needs which are not necessarily yet articulated, to explore emerging, trans-disciplinary or peripheral issues which have not yet received wide attention. As such, it is more complex and *cannot be as normative, especially with respect to the way the future is conceived, as is the case in corporate and industry TRM*. The basic assumption of a truly holistic POS&TRM must be that the future cannot fully be predicted: "if we know it already, it is no more the future", (cf. Popper, 1982).

In this respect POS&TRM fall within the classical 'foresight' school of thought based on the fundamental postulate that the future cannot be predicted and that various alternative futures of a single present state should be considered. This is the 'exploratory' approach very common in scenario building but innovative within the roadmapping methodology. So POS&TRM must integrate traditional technology roadmapping techniques and scenario planning approaches (Strauss and Radnor, 2004). Traditional technology roadmapping is typically implemented by assuming a straight-line projection or single scenario. Scenario building can enhance the flexibility and vision of roadmapping, capture and convey the full context of decisions, and enable anticipation of a broader range of possible change. Visions are often created precisely to influence the factual R&D agenda and should therefore not be neglected within policy intelligence roadmaps (Dierkes et al., 1996). Accordingly the time horizon of POS&TRM is much longer if compared to corporate or industry TRM, and can range from 15 to 20 years.

In brief, roadmaps for policy intelligence as to be applied in eGovRTD2020 have a longer time horizon, must integrate roadmapping and scenario-building techniques, start from main societal challenges, look beyond technology developments at scientific research and at socio-economic factors in a holistic fashion.

Given the overall approach of the eGovRTD2020 project, it is probably superfluous to stress that our roadmapping approach falls within the category of POS&TRM. It is actually one of the best examples to date of a holistic policy-oriented roadmapping approach integrating scenario-building and roadmapping techniques and looking at various societal challenges thus identifying needs that had not yet been articulated, emerging trans-disciplinary or peripheral issues which have not yet received wide attention. The eGovRTD2020 roadmap is positioned at a science and research level, i.e. the roadmap proposes research themes and actions in order to advance eGovernment research in the next future. The expected result is not a roadmap focused on a particular product or technology (the most usual type of roadmaps), but rather the definition of a strategic research programme for eGovernment.

In light of the complexity and multi-faceted nature of eGovernment, the approach chosen for roadmapping eGovernment research was perceived by the project partners as the only possible one for it is holistic look at technological, scientific and a broader socio-eco-

nomic, socio-cultural and political-institutional trends, integrating both roadmapping and scenario-building techniques. In the subsequent sections of this chapter, the operational techniques and methodologies for the four key phases of eGovRTD2020's roadmapping future eGovernment research towards a vision of 2020 are introduced.

2.5 Methodology to investigate the state of play
Authors: *Melanie Bicking and Maria A. Wimmer*

During the last decade, and in parallel with the development and spreading of Internet technologies, government agencies leveraged a number of ICT-tools, with the consequence that new ways of collaboration between agencies emerged. Most of the ICT developments in this area were technology-driven.

Although a large number of initiatives exist, lack of clear visions and of any interdependencies of such visions with eGovernment initiatives and respective technology developments have been identified. The aim of the state of play analysis was to gather visions, strategies and initiatives in eGovernment research and implementation, and to analyse the main tendencies and foci of these research activities, initiatives and strategies. The scope of investigation was international, with a concentration on Europe, USA and Australia[17]. Overall, the investigation was performed in form of desk research, i.e. scanning relevant literature and the Internet for strategies, policies, and project results (state-of-the-art studies, etc.) with similar objectives.

The growing awareness that eGovernment developments should be based on a holistic consideration (see section 2.3) guided also the investigations of the state of play analysis in eGovernment research and strategic programmes (Bicking et al., 2006b).

Thereby, analysis embraced research initiatives and programmes, research activities, as well as strategic programmes of Governments and ICT industry in eGovernment developments and implementation[18]. The objective of the analysis of relevant material was to identify:
- Current eGovernment research programmes and strategies of the European Commission, and of different countries.
- Current eGovernment policies and strategies in Europe, America and the Asia-pacific region relevant for eGovernment research and implementation.
- Related research projects.

In the analysis, the materials were studied along the four key aspects identified in the holistic approach as depicted in Figure 3 in section 2.3. Relevant topics of interest were extracted and compared by countries and continents.

2.6 Methodology for scenario building
Authors: *Marijn Janssen, Patrick van der Duin, Maria A. Wimmer*

2.6.1 General aspects on scenario-building
Scenario building is a technique to stimulate different perspectives and images on the

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17. Due to the fact that the project consortium was formed with partners from Europe, USA and Australia.
18. Please note that actual implementations and solutions of eGovernment per se have not been the object of study and, consequently, have not directly been considered and compared in the state of play investigation.

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future. This technique allows to better predict the evolution of a certain domain beyond short-term forecasting using the scenarios developed. As anticipated, its usage is a pillar in the innovative approach for policy-oriented roadmapping elaborated in this project.

Recently, scenario building has been recognised as a technique to predict and shape the innovation process. There are many different methods of scenario development (e.g. Bouwman and Duin, 2003, Glenn, 1999, Johnson and Whittingon, 2002, Bicking et al., 2006a).

Scenario building methodologies received a significant boost when organisations, such as Shell and the RAND Corporation, turned the simple 'what if' exercises performed by national armies into fully-fledged future research methods. Gibson (1996) found that in the 1960s and 1970s, a general sense of certainty existed about where we were going and how to get there. However, the lesson learnt is that nobody can just drive to the future on cruise control. At the turn to the twenty-first century, a more down-to-earth approach was applied to look into the future. As a consequence, the scenario method became more mature (Johnson and Whittingon, 2002).

In general, scenarios are an integral description of various information aspects of a context in non-formal, and narrative way (Carroll, 1995). Scenarios are being used in distinct contexts, and with different purposes, form, content and lifecycle. There are several discussion in the literature on the various scenario usage and contexts (Weidenhaupt et al., 1998). In our context of predicting the future beyond short-term forecasts, scenarios depict different - sometimes contradictory or paradoxical - perspectives or images on the future (Handy, 1995). They are used to sketch an uncharted landscape of the future. Handy (1995) argues that only if we understand these different, contradictory and paradoxical perspectives or images on the future we will eventually be able to find roadmaps to deal with desired and unwanted outcomes. Based on the insights from visionary views, concerted and focused actions can be derived to impact future developments by enhancing a desirable development or by avoiding negative or undesirable developments.

Scenarios are used to imagine the future of eGovernment in 2020. In the context of eGovRTD2020, the following characteristics of scenarios were used (Janssen et al., 2007a, Zuurmond et al., 2006):

- A scenario describes a coherent set of visions and archetypal images on a possible future.
- Scenarios are neutral: they describe good or bad futures without taking position of valuing these positive or negative futures.
- Consensus about developments or visions is neither necessary nor wanted.
- Scenarios may differ one from the other: even extreme opposite scenarios are encouraged. In such cases of extremely opposing ideas or contradicting visions, scenario axes need to be determined to bring the extremes into relation.

Scenario building does not pretend to fully predict the future. Since the future is all encompassing, a structured framework was needed. The scenario technique facilitates the development of images of the unpredictable future by identifying complementary and/or contrasting alternatives.

Dym et al. (2005) state that the researchers' creativity extends in ways of systematically asking, presenting and viewing issues and developing domain taxonomies as the process unfolds. The lower-level topics of interest relate to the phenomenon under study and attribute to the deeper understanding of the phenomenon itself. For each issue, multiple known and unknown alternative answers exist, regardless of being true or

false. The issues intend both to disclose the alternative known answers and to generate the unknown possible ones. As such, the issues are characteristics of divergent thinking, where the issues attempt to diverge from single ideas towards a coherent vision that can be created from them.

2.6.2 The eGovRTD2020 scenario-building methodology
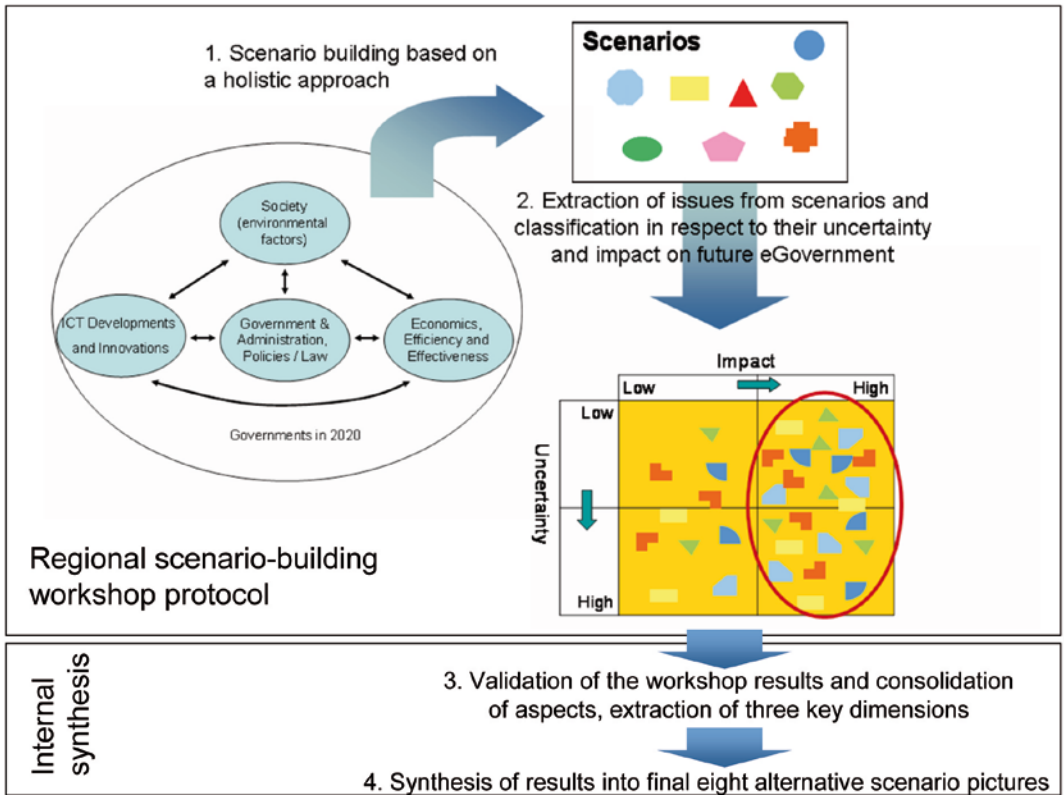
Figure 5: *Methodology for scenario building in eGovRTD2020*

Scenarios were developed in regional workshops with the participation of experts from governments, ICT industry and consulting, and academia. The methodology used to develop scenarios and to extract relevant scenario aspects is presented in Figure 5. For the workshops, a protocol of procedure was defined beforehand. Likewise, proper templates to guide the group discussions and to document the scenario elements were developed.

As part of the scenario-building methodology, experts were asked to extract important issues shaping the scenarios, and to assess the impact and likelihood of these issues. The rationale of assessing the impact and uncertainty of issues is that issues having a high uncertainty and high impact result in contradictory and alternative futures. Aspects having a high impact and low uncertainty result in one type of future. Both quadrants cover issues to be investigated in eGovernment research. Aspects hav-

ing a low impact (independently of the level of uncertainty) do not change Governments until 2020 and, consequently, were not given high attention in the subsequent work of eGovRTD2020. The assessment paved the way to formulate a final set of scenarios covering the most important issues identified, and developing alternatives out of the uncertainty assessments. These scenarios were the main input to the next phases of eGovRTD2020 (gap analysis and roadmapping).

2.6.3 Regional workshop protocol

The protocol of the scenario-building workshops (steps 1 and 2 of the methodology depicted in Figure 5) was:

1. Presentation of the project, of results from the state of play analysis, and of the scenario building approach.
2. Forming smaller groups of three to six participants with different expertise (criteria were: distinct stakeholder groups and disciplinary background).
3. Group work: Each group was asked to develop one or more scenarios for eGovernment in 2020 using a template as depicted in Figure 6. A group moderator helped each group in getting started with the visionary discussions, facilitated the process and secured conformity to rules set for the group discussion. Moderators had to take care that each of the aspects of the holistic framework was considered and described in the scenario(s) developed. Apart from the single aspects, the relations among the aspects were most interesting (e.g. How will governments use ICT in 2020 to serve citizens (society) and what economic values will be important thereby?).
4. Presentation of the scenarios and discussion in a plenary session.
5. Identification of key scenario issues related to eGovernment - individual exercise: Experts were asked to identify core issues of the scenarios presented, to write them on cards and to assess them both in terms of impact on eGovernment in 2020 and the likelihood to happen in 2020 (uncertainty). The cards with the issues were then placed by the experts in the assessment matrix as shown in step 2 of Figure 5.
6. Discussion of assessments in the plenary in order to resolve disagreements and to share a common understanding of the rationale for the assessment.

To develop scenarios in the workshops, it was important that the single aspects of eGovernment and their interplay were reflected also by their surrounding environment and global context (e.g. Emery and Trist, 1965, Heijden, 1996), i.e. cultures, subjective values, socio-demographic trends and other general developments (e.g. the speed of technological development, individualism in society, changing political climate, economic development, migration patterns or constitutional values like privacy and human rights). These factors shape futures in a longer term[19]. They may have an impact on long-term strategies for eGovernment developments and, consequently, were taken into consideration, even if the direct relation might not be obvious. For example, the low birth-rate in Western countries is a fact which may not be influenced by eGovernment actors. However, eGovernment developments need to be prepared to deal with consequences, such as ageing, immigration, lack of workforce etc.

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19. In short-term considerations these aspects are often neglected due to no directly recognisable impact.

Scenario description template

Background
The goal of this template is to have a uniform description of scenarios and to ensure that a number of elements are addressed. Participants are free to enter additional elements, or if they feel restricted, to deviate from the format.

Scenario title: _____

Summary: _____

_____

1. Contextual environment
- ❏ Society (e.g. how will the society look like, role of individuals and communities, attitude towards government)
- ❏ Political system and climate (e.g. societal and democratic values, governance value, transparency, privacy, security, enforcement, compliance, political system)
- ❏ Economic climate (e.g. employment, type of labour, age composition labour force, position in the world)

2. Governments and their stakeholders
- ❏ Government, administration, policies and law (e.g. roles performed of the government, national and local level, relationships with citizens and business)
- ❏ Kinds of services Governments will be providing and customers will be consuming (which will be the services Governments will be providing in 2020?)
- ❏ Mode of participation of stakeholders in the democratic processes (which stakeholders? Who will participate and how? What impact and power of decision-making will certain types of stakeholders have?)
- ❏ Government Environment (e.g. roles and activities of interest groups, NGOs private parties in government service provisioning and participation)

3. Technology developments
- ❏ ICT available (which kind of technology will we be using in 2020?)
- ❏ Interaction modes via ICT (how will stakeholders be interacting with this technology in order to provide/consume public services and to participate in political processes?)
- ❏ For which services and/or intentions of participation will the stakeholders use these technologies for interaction with governments in 2020?

***Figure 6:** Template to guide the focused group discussion in the scenario-building workshops*

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2.6.4 Synthesising the scenario results

Scenarios are constructed bottom-up and are heterogeneous. Each scenario may contain a number of issues related to the four key elements of the holistic framework and their interrelations (cf. categories settled in section 2.3). The scenarios may address issues on different levels of government (global, national, regional and local). Similar and overlapping issues happen to be mentioned in the different scenarios. Regional differences may occur due to distinct cultures, diverging State constitutions and organisational structures of governments.
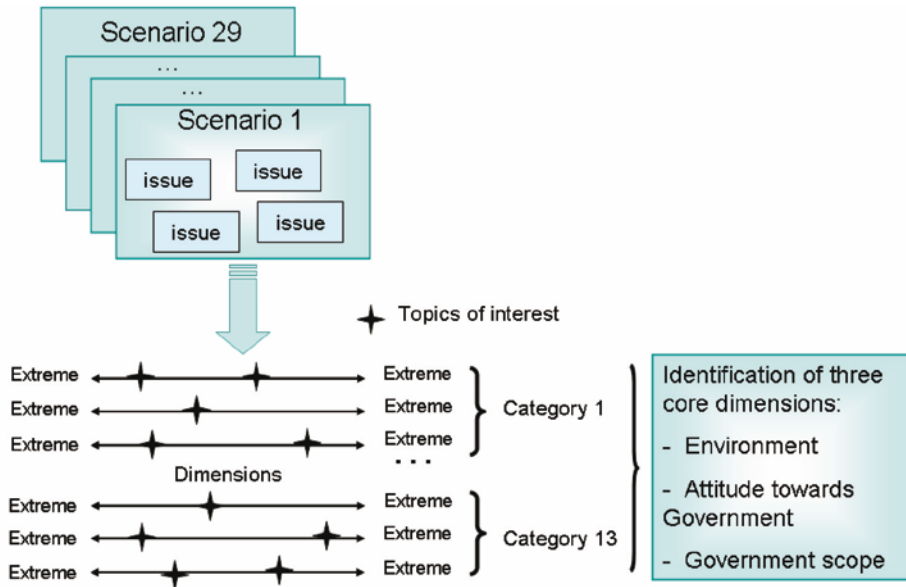
Figure 7: *Translating scenarios into dimensions and topics of interest*

In the synthesis of the scenarios and assessment matrices, each issue identified and extracted from a scenario was tagged with its origin (the scenario and workshop it was mentioned), was typed a topic of interest or a dimension, and was grouped into a category (cf. section 2.3). Figure 7 shows the technique used in a graphical sketch. The aims of this step were to clean the hundreds of issues from redundancies and to reduce them into a number of dimensions which can be handled (resulting in 159 dimensions in thirteen categories). The 159 dimensions were further analysed to extract the main dimensions. In this process, three key dimensions with their opposing extremes were identified, which were used to create a final set of eight scenarios. These core dimensions were the environment (will society, market and government be stable or disruptive in 2020?), the attitude towards government (trust or distrust in government activities), and the government scope (will governments provide all-inclusive services or concentrate on their core business and duties?).

On the basis of the identified core dimensions, a final set of eight scenarios was constructed *top-down,* which embodied the crucial issues mentioned in the regional scenario-building workshops in the respective positive or negative values. Each scenario was given a typical, easy-to-recognise and understandable name.

The final set of scenarios and the dimensions identified were further used to compare the future needs of research with current research (i.e. gap analysis, see subsequent sec-

tion for the methodology, and chapter 5 for the results). The results of scenario-building are documented in chapter 4.

2.7 *Methodology for gap analysis*
Authors: *Andreja Pucihar, Kristina Bogataj, Maria A. Wimmer*

In the most traditional and original strategic management approaches, gap analysis is performed comparing the 'as is' status to the normatively defined 'to be' status to be reached. Thus a gap is the difference between the 'as is' and 'to be' and, given the clear cut and to some extent deterministic way in which the 'to be' is conceived, can be assessed in a fairly objective and straightforward fashion.

It should be evident by now that, given the peculiar approach to roadmapping and the indeterminate vision of the future as possible alternatives defined in the scenario-building step, our understanding of a gap cannot be as simple and straightforward as in the case of traditional strategic management gap analysis.

The eGovRTD2020 project embodies a comprehensive and rigorous approach to assessing and understanding eGovernment as a complex and dynamic socio-technical system. The methodology encompasses both broad vision and detailed analysis. The scenarios, for example, present a set of coherent, alternative visions of the future for society, government, and ICTs. The gap analysis extracts the major discontinuities, unknowns, and contrasts between the situation today (examined in the state of play) and the possible futures determined in the scenarios.

Therefore, the eGovRTD2020 project partners have agreed on the following broadly defined understanding of a gap: a gap expresses a mismatch between issues of consideration. Gaps may thereby refer to an issue of current research (identified in the state of play), which does not meet the emerging needs of future scenarios. A gap may also refer to an issue, which is not addressed at all by current investigations of eGovernment research, or more broadly to discontinuities and unknowns. So gaps in our approach are not simply and strictly assessed differences between the 'as is' and the 'to be' status; rather they encompass different issues than can emerge by a broad comparison of the state of play with the alternative possible futures elicited by the scenarios.

2.7.1 Existing gap analysis methodologies
Gap analysis is carried out in many contexts and for various purposes. Some approaches reported in relevant literature are:

- *Soft systems methodology (SSM).* The SSM is an approach to investigate problem situations of the real world (Checkland and Scholes, 1990, p.18). Soft problems are difficult to define as they have a large social and political component. With the term *soft problems,* complex *problem situations* rather than straight problems are referred to. The key questions authors place are (Hicks, 1991, Lenart and Hribar, 2004, p. 226): Why are things not properly working the way they were expected to work? Is there is any way the problems can be turned into options and solutions? SSM was developed by Checkland for the purpose of dealing with problems of this type. The SSM was used as a basic reference concept for the eGovRTD2020 methodology introduced below.
- *SWOT analysis methodology.* SWOT analysis is a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a

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project, a business venture or in any other situation requiring a decision (Johnson and Whittingon, 2002). Strengths and weaknesses are internal to an organisation. Opportunities and threats relate to external factors (Johnson and Whittingon, 2002). The required first step in SWOT analysis is a definition of the desired end state or objective[20]. The objective must be explicit and approved by all participants in the SWOT analysis process. Once the objective has been identified, SWOTs are discovered and listed. SWOT analysis is used in eGovRTD2020 to clarify and evaluate the importance and relevance of problems and gaps identified in respect to eGovernment.

- *ITPOSMO methodology.* ITPOSMO stands for Information, Technology, Processes, Objectives and values, Staffing and skills, Management systems and structures, and Other resources, time and money. It is a commonly used gap analysis methodology in the field of eGovernment projects developed by (Heeks, 2001, Heeks, 2003). The author states that these seven dimensions are necessary and sufficient to provide an understanding of design-reality gaps in eGovernment projects. eGovernment success and failure depend on the size of gaps that exist between current realities and the design of an eGovernment project (Heeks, 2003, Heeks, 2001, Heeks et al., 1999). The ITPOSMO methodology best meets the needs for the eGovRTD2020 gap analysis. Consequently, it was the fundamental basis adapted for the gap analysis and roadmapping aims of eGovRTD2020.

These gap analysis methodologies share the intention to identify and validate the difference between a current state of affairs, and a future desired state. Thereby, the object of analysis can be classified as a problem (Lenart and Hribar, 2004, Checkland and Scholes, 1990, Možina et al., 2002) or as a gap (Heeks, 2003).

Above mentioned methodologies do not fully support the aims of gap analysis in the context of eGovRTD2020. Consequently, a revised methodology was developed, which is described next.

2.7.2 eGOVRTD2020 gap analysis methodology

The underlying concept to analyse gaps in the context of eGovRTD2020 is the holistic reference framework with the eleven categories (cf. section 2.3).

Figure 8 depicts the methodology for gap analysis in eGovRTD2020. To investigate the gaps in current research and the needs of research derived from future scenarios, the state of play of current eGovernment research and the scenarios of governments in 2020 were the main inputs. In both activities (see previous sections), issues of current research and of future needs of research are extracted, which comprise dimensions and topics of interest.

The analysis methodology consists of the following four steps:

Step 1 – **Identification of gaps in common issues**, where current research will not meet the future demands, or where research needs to be continued to meet the future challenges of a respective issue.

The identification of commonalities in current research issues and in future needs was carried out on the basis of dimensions and topics of interest from the scenarios (see chapter 4) and the current situation (presented in chapter 3). The common dimensions were compared and assessed in terms of whether current research will likely meet the future needs adequately, or whether there is a gap in current research, i.e. a risk that current research will fail in sufficiently addressing the research challenges emerging in

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20. Synonyms for "objectives" in SWOT analysis terminology are "desired end states", "plans", "policies", "goals", "strategies", "tactics" and "actions".
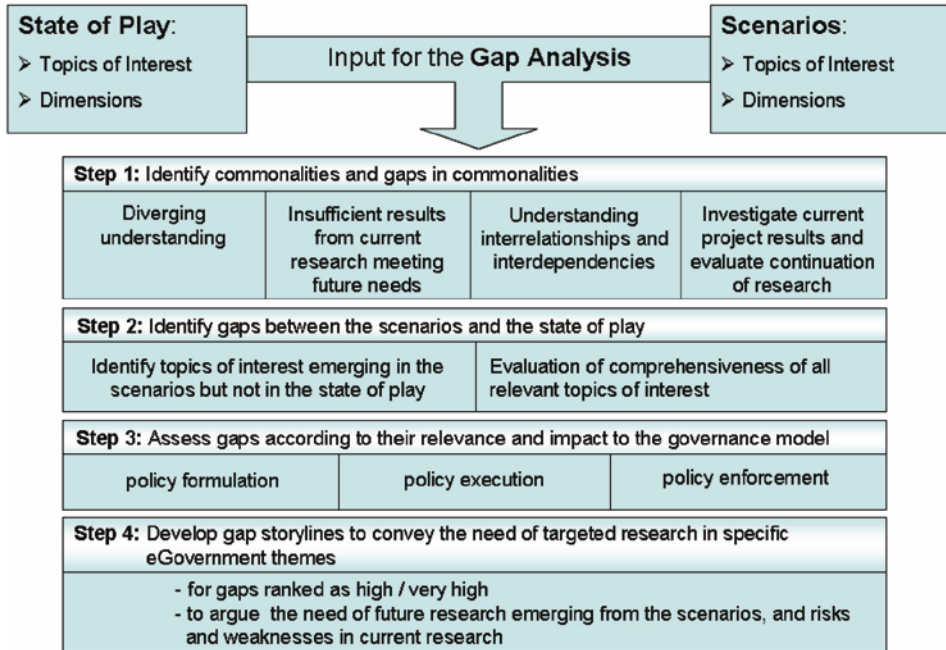
Figure 8: *Gap analysis methodology for eGovRTD2020*

the future scenarios. Special attention was directed to investigation of research which is not sufficiently meeting future needs.

In this way, relevance of current research for future needs was validated. If an issue was identified that needs further research, argumentation was provided as to why the issue is not covered satisfactorily yet (why is the issue still an open issue in future (e.g. it is only dealt with in a research project so far)).

The result of step 1 is a list of gaps identified in issues, which are not sufficiently re-searched yet. Each research gap of an issue is argued to provide evidence why it is identified as a gap.

Step 2 – **Identification of lacking dimensions and topics of interest,** which are not men-tioned in the state of play; however, these emerged in the visionary scenarios for 2020.

The aim of this step was to identify and define emerging issues (new challenges of eGovernment in 2020 to be resolved now), which are not addressed in current research.

Arguments were provided to evidence the need of researching the upcoming issues.

The result of this step is a list of gaps identified describing issues that are not yet ad-dressed in research but need to be investigated in the future.

Step 3 – **Gap assessment** according to impact and relevance towards the eGovernment and the eGovernance model.

The gaps identified in steps 1 and 2 were evaluated according to their relevance and impact for eGovernment and the Governance model of State. In public administration sciences, the core activities of State and public administration are defined as (Lenk and Traunmüller, 1999, Gisler, 2003):

- Policy formulation: definition of policies, strategic decision-making, formulation of laws, issues of constitutions of states, etc.
- Policy execution (Policy implementation): applying the policies formulated, i.e. inter-

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vention in society and market, regulations, execution of laws, etc. The core business of operative action in governments and public administration.

• Observation of society and market: in order to be able to formulate laws and strategic decisions as well as to intervene properly in society, market and environment, governments need to collect data and information on the actors and their behaviour.

These three activities are mutually dependent and can only be executed on the basis of a proper governance and management of state (i.e. a fourth key activity called public governance, good governance, or eGovernance).

This eGovernance model was the basis for the gap assessment in eGovRTD2020. Consequently, the gaps identified in steps 1 and 2 were assessed in terms of very high, high, middle, low, no relevance and/or impact to this governance model. Assessment in eGovRTD2020 was done, on one hand, by each partner in the project consortium based on the partners' expertise and knowledge in the field. On the other hand, experts participating in the regional roadmapping workshops and online consultation of roadmapping were asked to assess the gaps identified (see roadmapping workshop protocol introduced in section 2.8).
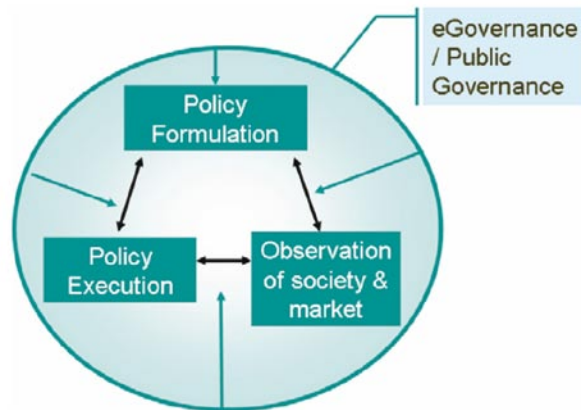
Figure 9: eGovernance model of State and public administration

Step 4 – **Gap storyline development** to convey the need of targeted research in specific eGovernment themes.

To convey the problem scope of gaps and their implications for the future scenarios in an expressive way, gap storylines were developed. Gap storylines stress the needs for certain future eGovernment research. They are specifically targeted towards strategic decision-makers responsible for eGovernment research programmes and eGovernment strategies and shall provide a line of argumentation for decisions to take in respect to funds for eGovernment research and to strategies and policies for strengthening eGovernment initiatives. Gap storylines lay the ground of argumentation for future themes of eGovernment research.

Gap storylines have been defined as being a coherent collection of issues (dimensions and topics of interest) within a category including a problem, a goal and potential solutions in the future. Gap storylines may enlarge issues of scenarios with new aspects to make them internally complete and consistent. In developing gap storylines, some dimensions identified in the state of play or in the scenario building exercise may also appear as solutions.

For gaps, which were assessed as having a very high impact and/or relevance to the governance model, gap storylines were developed. The storylines were aimed at giving a deeper understanding of future scenarios and the risks and weaknesses in current research.
The results of gap analysis are documented in chapter 4. In the next section, the methodology for roadmapping eGovernment research - the fourth step of the overall methodology of eGovRTD2020 - is presented.

2.8 eGovRTD2020 operational roadmapping methodology
Authors: *Xiaofeng Ma, Maria A. Wimmer*

Roadmaps which in section 2.4 have been termed TRM (traditional product or industry technology roadmapping) usually include three main components: the characterisation of the state of play (baseline), a clear and normative view of the future to be achieved and a structured set of actions to achieve the vision. The eGovRTD2020 roadmapping approach innovates with respect to this typical structure by including the scenario-building, followed by a gap analysis. Its goal was to identify the necessary transition steps to reach the visions of eGovernment in 2020, involving research, development and implementation. More specifically, key research themes and respective concerted research actions were defined[21] on the basis of a common understanding of visionary desired images of future government activities, as well as of challenges and deficiencies of current research (highly prioritised gaps). *Based on this roadmap, targeted actors in the field of eGovernment* in Europe and worldwide shall be facilitated and supported to take action to advance the field.

The eGovRTD2020 programme roadmap is to be positioned at a science and research level, i.e. the roadmap proposes research themes and actions in order to advance eGovernment research in the next future. The result is not a roadmap focused on a particular product or technology (the most usual type of roadmaps, see above discussion), but rather the definition of a strategic research programme for eGovernment. The research themes and activities (i.e. the research roadmap) are derived from a number of visionary scenarios (cf. chapter 4) and a thorough gap analysis of current research (see chapter 5).

To better identify the needed research themes and internal implementation models for effectively addressing and resolving research gaps in eGovernment, the eGovRTD2020 consortium designed a comprehensive roadmapping methodology as shown in Figure 10. The methodology comprised of four crucial activities:

1. Regional workshop with experts from governments, ICT industry and consulting, and academia, and an online consultation to reach beyond the regional scale. The aim of this activity was to assess the scenarios and gaps identified, and to define key research themes for eGovernment, including indication of actions and actors to implement the research, as well as a time-frame.
2. Validate and consolidate the inputs from the regional workshops and the online consultancy towards a research roadmap for eGovernment.
3. Expose the condensed research themes extracted from the regional workshops and online forum to a wider group of experts through a focused consultation workshop, and integrate the inputs gained thereby to the eGovernment research roadmap.
4. Assess the importance of the research themes by a larger audience via an online survey, and prioritise the themes.

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21. The roadmapping results are documented in chapter 6.
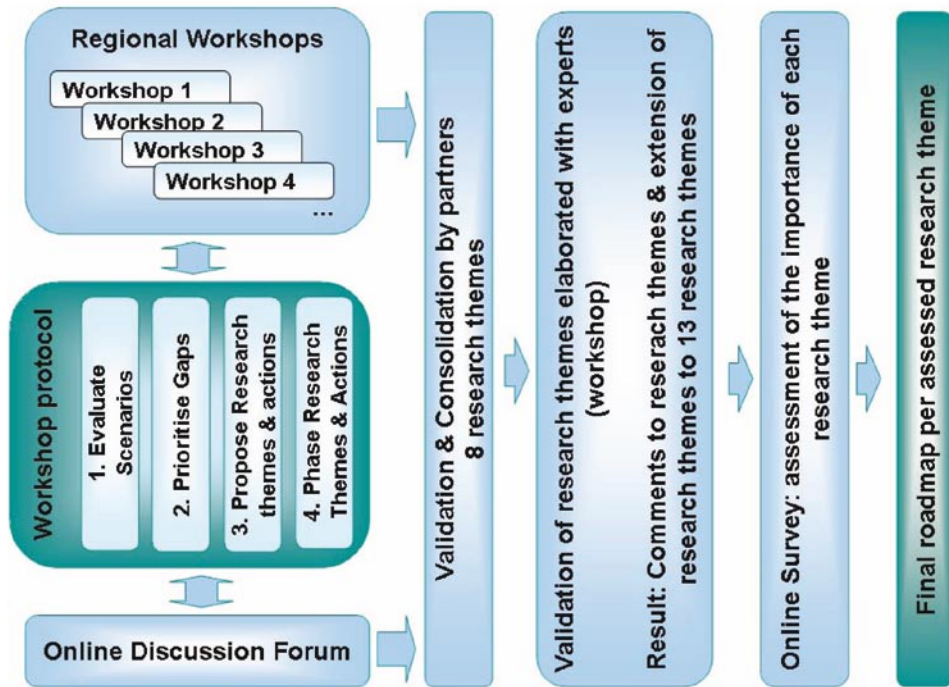
Figure 10: *Overall eGovRTD2020 roadmapping method*

The main aims and protocol of the regional workshops and the online consultation were to:

1. *Assess and comment the final eight scenarios.* The aim of this step was to validate the descriptions and comprehensiveness of the final eight scenarios by the experts in order to convey the most important aspects of potential futures of government activities in 2020.
2. *Assess and prioritise the identified gaps.* The participants were asked to assess the identified gaps in order to confirm validity of the assessment of highly relevant and important gaps performed by the project partners in the gap analysis.
3. *Identify and develop research themes and actions.* Group discussions in the regional workshops and an online discussion forum were used to develop important themes for future research in eGovernment. The groups were formed based on the interest and expertise of workshop participants. Each group was given a limited scope of consideration (ICT in governments, Government modernisation, and Interaction with the constituency and environment). For the most important research themes, research actions and means of implementing the actions were formulated for target stakeholders.
4. *Phasing the proposed research themes and actions.* The proposed research actions were phased into a time scale of short-term (2006-2010), medium term (2011-2015) and long term (2016-2020) implementation.

Since the results gathered per workshop improved the validity of former results, an evolutionary approach was used to conduct the series of regional roadmapping workshops (for details see chapter 6). Consequently with the experience and feedback

gained from each workshop, the materials and approach for the next rounds of road-mapping workshops were updated.

Based on the inputs of the regional workshops and the online consultation, the project consortium synthesised and consolidated the results and extracted a set of eight research themes, actions and measures. These results were exposed to experts via a) a validation workshop and b) an online survey to assess the importance of each research theme.

The results of the various activities along the roadmapping phase of eGovRTD2020 are documented in chapter 6. Thereby, a structured form of describing each research theme, the actions to take, the actors addressed and the time-span in which actions should be addressed is used. It comprises of three specific elements:

1. A detailed textual description of the research theme, including the following:
    a. The title of a research theme
    b. A brief abstract of the research theme
    c. Three keywords of the research theme
    d. Key research questions of the theme
2. A description of the research actions, means of actions, key actors and time-frame of action (see template in Table 2); and
3. A roadmap chart indicating per research theme the actions in a time-scale as depicted in Figure 11.

Table 2: *Template to describe actions, means, actors and timeframe for research themes (example extracted from the research theme: Trust in eGovernment)*

#	Description	Means	Actors	Timeline
1	Studies to investigate a proper understanding of trust in eGovernment, including:	Action research, analysis, desk research	Research with key players from governments with some support of ICT industry & consulting	now -> 2010
	What is trust, and how to create trust?			
	The differences among key trust relationships in C2G, B2G, G2G			
	What kind of trust impacts eGovernment? E.g. trust in government, trust in ICT, trust in jurisdiction, execution and legislation			
	To what degree trust is needed in order to offer sophisticated eServices?			
2	Develop a framework of mechanisms for monitoring trust between governments and citizens, including:	Action research, gap analysis	Governments, research and consulting	now -> 2010
	Can ICT enable fair behaviour?			
	What kind of behaviour is acceptable?			
	How to prevent unfairness?			
3	Assessment of the risks of a trust framework for eGovernment, thereby identifying both the potential threats and the level of distrust which can be tolerated	Action Research	Research, consulting, governments	now -> 2010

Figure 11: *eGovRTD2020 roadmap chart template (example for the research theme: Trust in eGovernment)*

The final eGovRTD2020 roadmap suggests thirteen research themes, each with a number of activities and actors (see chapter 6). Consequently, targeted decision makers at the EU level, national level, ICT industry, etc. can select the research related to the scenario hypothesis they favour. The eGovRTD2020 roadmap, hence, is a communication and awareness creation tool for relevant strategic decision makers responsible for advancing society, government and industry developments.

In the next part, the results of the state of play analysis (chapter 3), the scenario development (chapter 4), the gap analysis (chapter 5) and the research roadmapping for eGovernment (chapter 6) are reported.

A more detailed description of each phase's methodology and results are available in the technical reports (Deliverable D 2.1, 2006, Deliverable D 3.1, 2006, Deliverable D 4.1, 2006) of the eGovRTD2020 project available at the project's website: www.egovrtd2020.org.

3. State of play in eGovernment research and implementation in Europe and worldwide

Authors: *Melanie Bicking, Michael Bowern, Meghan Cook*

The state of play of eGovRTD2020 reflects the current situation of eGovernment research and eGovernment related strategic policies in the European Union (EU) and two other global regions (USA and Australia). However, it does not include synthesis of implementation projects.

In the following, an overview of eGovernment research themes and topics of interest is given, using the information available from the research programmes and related strategic policies of Europe, the United States of America (USA), and Australia. For the analysis, the methodology described in section 2.5 was used. The analysis was carried out in the period of January till May 2006, with some further investigations to reflect updates in the chapter at hand. The full state of play report (Deliverable D 1.1 (2006)), available at the project website (www.egovrtd2002.org), documents more detailed findings from the analysis.

3.1 eGovernment research in different global regions

The following table provides an overview of how eGovernment research is funded by governmental institutions in the global regions of the EU, the USA, and Australia. Other global regions, e.g. Asia, are not included in the table and the following comparison due to the fact that the eGovRTD2020 consortium was formed by partners from the EU, the USA and Australia, and detailed information from other regions was not easily accessible. When comparing the EU, USA and Australia in terms of their research initiatives in eGovernment, one also has to bear in mind that the EU consists of a Federation of independent Member States, while USA and Australia have a different structure of federation.

Table 3 presents the main indicators for eGovernment research funding and compares funding practices in the EU, the USA and Australia. Starting with the comparison of the major source of support for eGovernment research, Table 3 shows that in Australia and the USA the major source of research funding is at the federal level, from the Australian Research Council (ARC) and the USA's National Science Foundation (NSF). A similar situation characterises Europe, where the overwhelming majority of research funding comes from European Commission (EC), which with some freedom and optimism can be considered as the 'federal' centres for its 27 Member States. However, the USA and Australia also have additional sources of eGovernment research funding from other federal agencies, eGovernment initiatives by State governments, and some industry support. In the EU, pure research funding is mainly provided by the European Commission.

Taking into account the high-level strategic objectives defined by the EU in its own key eGovernment implementation priorities, its Member States are mostly focusing on implementing existing ICT-solutions and applications to eGovernment implementation projects or programmes. In most cases, no research aspects are involved in these implementation projects as most countries in the EU do not have specific programmes for eGovernment related research. Consequently, if no focused eGovernment research is funded at the EC level (e.g. as it is planned under FP 7 running from 2007 until 2013, but see the discussion in chapter 8), there could be a substantial lack of eGovernment research in the EU for the next half decade.

Table 3: *Overview of eGovernment research in the EU, the USA and Australia*

Global regions		
EU	**USA**	**Australia**
Major source of support European Commission Community Research & Development Information Service (CORDIS)	The US National Science Foundation (NSF)	Australian Research Council (ARC) administers the National Competitive Grants Program (NCGP)
Project participants (related to major source of support) Ministries, Universities, Research centres Private consulting companies Special agencies	University-based researchers Non-profit professional associations	University based researchers Industry partners Professional associations Federal and State Government agencies Research centres
Additional sources of support Pure eGovernment research is mainly funded at the EU level National governments fund mainly implementation projects	Federal agencies	eGovernment initiatives by State governments University and industry support for PhD research and small projects.
Conditions of success for projects Meet programme thematic priorities Different types of organisations International Consortium of EU Member States	Multidisciplinary approaches Partnerships with government agencies (theory and practice)	Projects should address national research priorities covering the environment, health, future technology and security.
Funded projects range in size from Total of € 3 625 million for funding Information Society Technologies over the duration of FP6	Less than € 14 840 to large projects that exceed € 1 400 000	Total of € 219 million for all new projects in 2006, including eGovernment. ARC: a minimum of € 12 000 to a maximum of € 300 000
Length of funding A year to 4-5 years	A few months to up to 5 years	Typically 1 to 3 years
Characteristic of research agenda Directive, i.e. it does specify thematic priorities, and outcomes	Not directive, i.e. it does not specify questions, methods, or outcomes	Not directive, but there are specific principles to follow for the allocation of grants

(Leftmost column label, rotated: **Criterion of comparison**)

Table 3 also depicts the requirements research projects have to meet in order to get funded in the different regions. In the EU, research projects have to meet the thematic priorities of the programme they are applying for. Also, an international project consortium is mandatory for EU-level funding, consisting of partners from at least two different EU Member States, as well as from different typologies of organisations (academia, industry, public sector). By comparison, the USA requires a multidisciplinary approach and the cooperation and collaboration of theory and practice, i.e. partnerships between government agencies and university-based researchers, which has also been an implicit requirement in EC-funded projects for several framework programmes.

Funding for projects in Australia is allocated by evaluating competitive proposals on the basis of national priorities, as shown in Table 3. eGovernment research is not a priority at the national level, and there are very few funded projects specifically focused on eGovernment. All of Australia's state and territory governments are implementing eGovernment applications, but at different rates, and for different functions. However, the driving force is from the federal government, which has published a vision and strategy for eGovernment in 2010 (AGIMO, 2006). This strategy will set the direction, principles, and standards of eGovernment for federal agencies, and most likely for the states and territories, to provide truly 'joined up' government across the nation, while still recognising the different priorities and circumstances of each jurisdiction. It is also likely to be the most logical, efficient and effective way to implement eGovernment in places where there are multiple jurisdictions. The same could apply to the development of eGovernment for the EU, but the challenges are compounded by the different historically rooted administrative traditions and practices, and the wide range of languages and cultures of the European Member States.

In the USA many federal agencies fund eGovernment research because they have identified a number of specific issues to be addressed. By contrast, a possible interpretation of the lack of eGovernment research funding by national governments in the EU could be that many Member State governments have neither a definition nor a vision of eGovernment, and no strategic plan to transform traditional government into eGovernment. This point may benefit from further considerations.

There are further differences in eGovernment research in the three different regions. The USA and Australia fund eGovernment research across multiple disciplines. On the contrary, most eGovernment research projects at the EU-level focus on ICT, and national level eGovernment funding mainly gives emphasis to the implementation of ICT in the public sector, without any core research. However, recently, this has started to change in European Member States such as Germany, Italy, Sweden, and UK.

The three regions are also different from each other in terms of the length of time their research projects are funded. EU research projects in general are funded for a longer time than those funded in the USA or in Australia. In particular, much of the funding in the USA is through the National Science Foundation (NSF). Through NSF, some projects are funded for as little as a few months, while other projects are funded for a couple of years. Two funding streams that yield shorter-term initiatives are the Small Grants for Exploratory Research (SGER) and Workshop Grants. SGER grants, usually smaller in amount as well as shorter in length, are often pursued to explore an idea that may result in the development of a larger study and proposal. These funds are available for studies that investigate transformative research ideas; or application of new expertise or studies that may catalyse rapid and innovative advances.

NSF's Workshop grants help identify key issues within the domains of government that could benefit from formal research partnerships between universities and government agencies at the national, state, and local levels. Because NSF funds such a large portion of eGovernment research in the USA, many long term research initiatives have emerged from discussions at NSF funded workshops.

Furthermore, the NSF and ARC schemes provide funding for new projects on an annual basis, there is no Framework Programme such as FP6 and FP7 in the EU. In the USA, the NSF presents broad funding themes for digital government under their Computer & Information Science and Engineering programme but does not set forth direct questions or methods. Each year the focus shifts to address emerging topic areas. Thus, in the

USA, research is solicited under broad theme areas but questions, methods and outcomes are left to the research teams.

The next section will provide an overview of research addressed by several national and international strategic documents and programmes worldwide. Research themes are classified towards four main categories: ICT related research, government modernisation driven research, contributing the information society and research in legal economic issues.

3.2 eGovernment research in Europe, USA, and Australia

3.2.1 Overall direction and policies

In looking at general policy and direction for eGovernment research in EU, USA, and Australia, the major difference is that in the European Union the EC sets the research direction in such a way that foci of the EC and national governments are very similar. This is due to the fact that the European Commission is the acting body of the European Union, i.e. the union of the European Member States. The EU Member States agree on strategic directions, which are published in strategy and policy documents by the European Parliament, and which are the baseline for the EC activity. When agreeing on EU strategies, the European Union Member States commit themselves to take up the agreements of the EU strategies to implement them in the national environments likewise. By contrast, in the USA and Australia, the research direction is defined by the organisations doing the research. Another difference is in how eGovernment is defined. eGovernment in the USA, usually referred to as digital government, encompasses civic, social, technical, managerial, and operational perspectives. While the broad definition of eGovernment in the EC is similar to that of the USA, the Framework Programme for funding research contrasts with the EC definition because it tends to focus more on a technical perspective, with services to citizens and applications for operations. Australia has a similar approach, focusing on service delivery, and has a key strategic priority to raise Australian public sector productivity, collaboration, and accessibility through the effective use of information, knowledge and ICT.

The subsequent sections provide more detailed information about each region's research agenda.

3.2.2 Europe

In Europe the EC specifies thematic priorities for the focus of funds for eGovernment research. In the 5th FP, the focus was on implementing eGovernment through online availability of information and access to online documents. Reengineering of business processes was barely an issue. FP 6 had a shift of focus towards consideration of back-office modernisation. Nowadays, funding at the European level is provided mainly for networked solutions, interoperability and some major eGovernment themes that have not yet been developed well, including eParticipation and electronic Identity Management.

At present, the European Union's strategic policy foci are primarily oriented towards the Lisbon Strategy (2000) and the new i2010 initiative (2005b). Both strategic documents are groundbreaking for eGovernment research. In these strategic documents, the focus is on more investment and innovation, particularly in increasing the speed of innovation development and productivity. Furthermore, the i2010 document highlights

the need to set up a single European information space and to promote an inclusive European Information Society. These strategies are reflected in research programmes funded by the EC, and in many European Member State strategies to modernise their governments by implementing eGovernment. EC research programmes related to the i2010 strategy and the eEurope 2005 Action Plan (EC 2002) are e.g. the MODINIS programme (MODINIS, 2003); the Interchange of Data between Administrations (IDA, 2004); Interoperable Delivery of Pan-European eGovernment Services to Public Administrations, Business and Citizens (IDABC) programmes (IDABC, 2005); and Trans-European Networks (eTen, 2007).

The Danish Technological Institute (DTI) together with the European Institute of Public Administration (EIPA) elaborated a key forward-looking study which resulted in a report towards the eGovernment vision for the EU in 2010 (Millard et al., 2006). This report identified the following major current research areas of interest in Europe assessed by government stakeholders: harmonisation and interoperability, trust and security, access for all to government services, knowledge management for data, understanding individual user needs, change in the public sector, and new government delivery models. Accordingly, current eGovernment research was clearly focused on technology use and the exploitation of these solutions. The expected future developments emphasised that more research activities in the field of user needs and usability, socio-economic inclusion, eDemocracy, value chains, and cross-sector public services is needed.

Current FP 6 projects have a focus on wider organisational aspects of service design and delivery. Overall management of change to achieve networked governments is the primary aim. In future research, a stronger link among European and national policy requirements should be emphasised, especially a) for social cohesion and inclusion policies, and b) for economic, and cross public sector policies. The first policies were emphasised mostly by academia, the public sector and users; the latter by consultants, industry and non-Europeans (Millard et al., 2006).

The top ten topics of interest in eGovernment at the national level, counted by the number of their occurrences, are the following: generation and delivery of added value services, document identity management and authentication, security and trust, eInclusion and eParticipation, access via multiple channels, understanding user needs and user-centric services, (technical) interoperability, eLearning, (public) eProcurement, and quality management. In Table 4, these ten most emphasised eGovernment research topics from the EU are compared with those of the individual Member States. As can be seen, some priorities are the same, others differ.

The themes surrounded by the green rectangle represent the three top research foci, which are ranked high at the EU level as well as at national level.

It has already been mentioned that most EU Member States focus on technical eGovernment implementation without integrating research contributions or investigating relevant research questions. Most countries in the EU do not have their own research programmes for eGovernment related research.

A further insight gained so far is that, currently, governments in the EU Member States barely work in cooperation with academia in order to advance the integration of innovative research with practical applications.

In addition, there is a gap between the various levels of eGovernment implementation across the EU. Having a closer look at the new EU Member States, eGovernment related funding by the EC is situated under the structural programme of the EC that funds pure implementation. As a result, the eGovernment efforts of the new Member States con-

Table 4: Comparison of research priorities extracted from EC related strategic documents and national EU Member States strategies

EU level topics of interest	Country level topics of interest
Security and trust	
Understanding user needs, user-centric service delivery	
Harmonisation and interoperability	
Inclusive European Information Society	eInclusion
Socio-economic inclusion	eLearning
eDemocracy and eParticipation	Multiple channel access (Accessibility)
Access for all to public services (Accessibility)	(Document) Identity management and authentication
More user friendly systems (Usability)	Added value service generating and delivery
Knowledge management	Quality management
Investment to sustain ICT innovation and R&D	eProcurement (eBusiness with the private sector)

centrate on bridging the gap between themselves and the established countries. For this reason, specific eGovernment research is also rather neglected.

Overall, eGovernment research at the EU level is visionary but vaguely formulated. As shown in the research topics listed in Table 4, the EU's focus is on the creation of an inclusive European information society (see red rectangle). Recommendations given in the study by DTI and EIPA (Millard et al., 2006) are considered and transformed in the current eGovernment research programmes funded at the EU level. Thereby, the research focus is on the interface between government and citizens in order to achieve more usability and intuitive handling of public electronic services. Further high priority research topics at the EU level are knowledge management, and spurring innovation in order to achieve the Lisbon targets.

While at the EU level, a clear focus on social aspects can be recognised, national governments' eGovernment priorities spread more widely. This observation is colour-coded by the red and blue rectangles on the right side of Table 4. The red rectangle indicates foci on social aspects of national governments' activities similar to the EU foci. The blue rectangle marks national foci on economic aspects aimed at service delivery. One reason for these diverging foci might be the gap between various levels of eGovernment implementation across Europe[22]. Northern and western EU Member States are assessed as being more advanced at implementing eGovernment than southern and eastern countries. In particular, the new EU Member States seem to heavily concentrate on progressing eGovernment implementations[23] in order to catch up with the more advanced countries. As a consequence, the lack of eGovernment research in these areas can be supported by a reasonable argument, while the reason for little or no research in western and northern Member State countries remains unclear. A few Member States have launched focused

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22. See IDABC's eGovernment observatory. eGovernment facts sheets by country, available at http://ec.europa.eu/idabc/en/chapter/383 (last access March 2007)

23. See IDABC's eGovernment observatory. eGovernment facts sheets by strategy, available at http://ec.europa.eu/idabc/en/chapter/419 (last access March 2007)

research initiatives only recently (e.g. Italy, Sweden and UK, with a focus on eParticipation).

3.2.3 United States of America (USA)

In the USA, the National Science Foundation (NSF) is the major source of support for eGovernment research in the United States. Under the term "Digital Government Research" NSF has supported more than 200 investigations since the 1990s. The focus of digital government research lies at the intersections of computer and information sciences, related social, political, and behavioural sciences, and the problems and missions of government agencies. Digital government research studies the use of information and technology to support and improve public policies and government operations, engage citizens, and provide government services while addressing technical, social, and organisational perspectives (see also the definition of eGovernment by the EC in section 2.1).

Multidisciplinary approaches are encouraged and partnerships with government agencies are a required element for most projects. The digital government programme partners with other programmes at NSF (such as Information Technology Research and Digital Libraries programmes) to share funding for proposals that meet the requirements of more than one programme. In addition, some federal agencies, such as the Library of Congress, share in the funding of digital government research that addresses that agency's research needs.

NSF funds digital government research that covers a variety of public sector topics including Communication, Digital divide, Education, Government records, libraries, and archives, Government statistics and surveys, international problems and comparative studies, Intra- and intergovernmental relations, Law and regulation, Natural resources management, Organisational and institutional analysis, Political processes, preparedness and national security, Privacy, Public management and administration, and Service delivery.

The digital government programme at NSF welcomes research that involves many different methods and approaches to information technology, use, and management, including any appropriate combination of frameworks and methods that suit the questions to be studied, such as data sharing and integration, digital libraries and archives, geographic information systems, human computer interaction, information architecture and management.

The research programme at NSF sets forth general themes but leaves the focus and the structure of the investigations up to the researchers. Ultimately, the goal is to generate knowledge for both research and practical purposes. Workshop grants help to identify key issues within the domains of government that could benefit from formal research partnerships between universities and government agencies at the national, state, and local levels. Examples of such workshops include:

- Towards the Digital Government of the 21st Century (Schorr and Stolfo, 2002).
- Some Assembly Required: Building a Digital Government for the 21st Century (Dawes et al., 1999).
- Information, Institutions and Governance (Fountain, 2003).
- Responding to the Unexpected (Arens and Rosenbloom, 2002).
- It's About Time - Research Challenges In Digital Archiving And Long-Term Preservation (Hedstrom et al., 2002).

Consequently, digital government research grants cover a variety of public sector topics including communication, digital divide, education, government records, libraries, and archives, government statistics and surveys, international problems and compara-

tive studies, intra- and intergovernmental relations, law and regulation, natural resources management, organisational and institutional analysis, political processes, preparedness and national security, privacy, public management and administration, and service delivery. Thus, much of the digital government research that has emerged from the USA focuses not only on technical perspectives but also a large amount of work has been done learning about the social implications of eGovernment.

Two recent initiatives funded by NSF seek to build a community of international digital government researchers: "Building A Sustainable International Digital Government Research Community", a project carried out by the Center for Technology in Government, strives to create a framework for creating a sustainable global community of practice among digital government researchers and sponsors. A forthcoming research report will present illustrations of international digital government research, research sponsors, and conferences (CTG, forthcoming). Also the newly formed Digital Government Society of North America is an organisation of professionals and scholars who share an interest in furthering the development of democratic digital government (DGS, 2007).

3.2.4 Australia

In Australia, the main source of research funding, and the primary source of advice to the government on investment in the national research effort, is the Australian Research Council (ARC, 2007). The ARC's mission is to advance Australia's capacity to undertake quality research that brings economic, social and cultural benefit to the Australian community. ARC funding programmes come under the umbrella of the National Competitive Grants Program. Later paragraphs in this chapter will briefly describe specific research projects funded by the ARC which have a focus on, or an application in eGovernment.

Funding is also provided by the ARC to establish interdisciplinary and inter-university networks, with the purpose of promoting innovative research. Several of these networks have direct application to eGovernment research, such as those for governance, financial integrity, security, communication between machines and humans, complex open systems, economic design, communications technology, and enterprise information infrastructure.

Australian governments at the state and federal levels have strategies in place to continue their expansion of eGovernment services. While there is no specific major eGovernment research programme, these strategies are supported by a range of research projects, some with a specific eGovernment focus, and many others have more general application, particularly in eCommerce.

National ICT Australia (NICTA, 2007) is a government funded ICT research organisation with laboratories in several Australian cities. NICTA's Empirical Software Engineering group has established a new research initiative, which will bring together government departments, industry, researchers and educators to provide holistic solutions to the challenges of eGovernment.

Finally, there are small amounts of funding provided by some universities and industry groups for postgraduate research scholarships and small projects, some of which have an eGovernment focus.

3.3 ICT related research programmes and strategies

Across the continents a similar focus in eGovernment research emerges: identity management and authentication, standardisation of basic infrastructure, cyber security, and

information management. The programmes and strategies detailed below address core eGovernment and digital government issues.

3.3.1 Europe

In the EU the continued focus is creating trust and security by national and international ICT research. Of particular interest are authentication and identification for interaction purposes. Biometrical identification is strongly promoted by governments (European Commission, 2006b) in order to generate more user acceptance of, and participation in electronic public services. Consequently, EU Member States recognise a need to intensify research in the field of permanent document identity and identifiers. Therefore, identity management within the virtual world becomes more and more important.

Within the EU, regional differences exist, for example, the Baltic States do not have such a strong focus on trust and security, identity management and authentication as other countries have. Future research into these matters and the resulting eGovernment applications will need to take these regional differences into consideration.

As a consequence of the new public management movement, seamless data exchange becomes a central requirement for improved harmonisation and interoperability. Thus, standardisation needs basic infrastructure technologies and domain specific technologies. Especially in respect to the approach of a single access portal, semantic interoperability is required to support avatars and intelligent agents, which will lead users through complicated processes and which will route them to the back-office.

In line with the Lisbon strategy and the i2010 targets, many existing strategies identify accessibility and broadband availability as crucial factors within the public sector. More than ever, "access for all" to government services requires socio-economic research to better understand the needs of certain target groups with different skills and knowledge (e.g. the elderly, immigrants). Making information more accessible via indexing and structuring data e.g. through semantic web or data mining have been identified as important topics to be investigated. Likewise, multi-channel accessibility is at the centre of many strategies, and in particular access through mobile devices is often mentioned in relation to multi-channel access*.*

3.3.2 United States of America (USA)

Although NSF funds a majority of the research in the United States, the US Department of Commerce, National Institute of Standards and Technology (NIST) also sponsors digital government research. NIST's Information Technology Laboratory conducts IT-research that contributes to national and industry standards for such topics as computer security, personal identity, digital information access, software development, and networking. Also, research sponsored by the branches of the Armed Forces as well as by the US Department of Defence conduct and support a wide variety of research programmes aimed at improving national defence.

The US Department of Homeland Security (DHS) sponsors technology research focused on the ability to detect and deter attacks on information systems and critical infrastructures. This research programme supports university-based centres of excellence and examines issues related to security systems and to the security-related elements of the Internet, data bases, information systems, and telecommunications networks.

One example of an NSF funded initiative that looks at how federal statistics are used in collaborative eGovernment research is Collaborative Research: Quality Graphics for

Federal Statistical Summaries (dgQG, 2002). This effort focuses on developing and assessing quality graphics for federal statistical summaries considering perceptual and cognitive factors in reading, interacting with and interpreting statistical graphs, maps and metadata.

3.3.3 Australia

An approach by several federal government agencies towards their implementation of eGovernment applications is to consider the citizen as a customer for their services and to have a business approach to the implementation of these services. This is understandable in many cases since the services include the payments of benefits and pensions. This ARC funded project addresses a common problem in both eGovernment and eBusiness:

- *Create Once, Use Many Times - The Clever Use of Metadata in eGovernment and eBusiness Recordkeeping Processes in Networked Environments.* This project will develop a proof of concept prototype to demonstrate how standards-compliant metadata can be captured *once* in particular application environments then reused many times across business applications and in different environments. Implementation of the prototype in a test-bed site will provide a model for best practice.

3.4 Programmes and strategies for government modernisation research

At the core of many eGovernment research initiatives are practical projects that address government use and management of information technology. In all three regions the national governments are taking the lead in learning how ICT is used in transforming both back-office applications as well as front-line interactions with citizens. More detailed descriptions of initiatives are as follows.

3.4.1 Europe

Government modernisation research can be divided into two research areas: First, the interaction between government and citizens or businesses, which requires research to understand user needs and to develop user-centric systems. Particular attention is given to the interfaces between both citizens and government, and between people and ICT in general. In respect to the eGovernment strategies and policies depicted in chapter 3.2.2, emphasis at the national level focuses on the creation of a single point for citizens to access public services. National governments aim to expend their efforts in generating and delivering added value services.

The second research area covers government modernisation at the back-office. Here, the research focus is on eAdministration with regard to organisational modelling, in particular on the simplification of administrative procedures, transparency, and integration and cooperation between all levels of the administration. Furthermore, research on providing cross-organisational workflow management is strongly linked with interoperability and new ways of delivering shared services over the Internet. Especially, the seamless exchange and storage of documents is targeted, both at the technical and organisational levels. National governments also address knowledge management which could support the sharing of experiences, good practices and information. In this respect, national governments are also focusing on new working methods and public servant training.

Among the current sectored foci, eProcurement research is stressed by many of the existing studies (Mahroum et al., 2005), because it creates high impact and benefits to

both public agencies and businesses. Consequently, current research focuses on the development of common solutions and standards for an appropriate electronic public procurement system across the EU and across all levels of the public sector.

3.4.2 United States of America (USA)

US Department of Justice (DOJ) sponsors research projects that address improvements in law enforcement and criminal justice. Interagency and intergovernmental information sharing is a strong theme in much of this work. Projects are carried out by university-based investigators as well as by professional law enforcement and information technology management associations. The National Institute of Justice (NIJ), the research arm of US DOJ, sponsors technology research in several areas pertaining to law enforcement including crime mapping and communications technologies.

In addition, the National Institutes of Health (NIH) are part of the US Department of Health and Human Services (US DHHS) which is responsible for many programmes that address public health, social services, and related areas.

The National Academies (NA) are chartered by Congress to serve as an independent advisor on scientific topics of importance to the nation. Study panels made up of leading scientists assess various topics and issue reports, usually at the request of a federal government agency. The Computer Science and Telecommunications Board (CSTB) of the NA has issued reports on information technology research for crisis management, federal statistics, and innovation and eGovernment. Also, the National Historical Publications and Records Commission (NHPRC), the research arm of the National Archives and Records Administration, supports a research programme aimed at improving archival and records management theory and practice.

Examples of research projects in government modernisation funded by NSF include:

- *Connecting to Congress: The Adoption & Use of Web Technologies Among Congressional Offices.* Research on how Members of Congress use, or should use, the Internet to provide information to and interact with their constituents.
- *Modelling the Social and Technical Processes of Inter-organisational Information Integration:* This project develops and tests dynamic models of information integration in multi-organisational government settings in law enforcement and public health, combining organisational behaviour, computer and information science, and political science perspectives; it uses both system dynamics and social process modelling (CTG, forthcoming).
- *COPLINK Center: Information and Knowledge Management for Law Enforcement* (Chen et al., 2004) develops knowledge management technologies and methods for capturing, analysing, visualising and sharing law enforcement information and studies the organisational, social, cultural and methodological impacts and changes needed to maximise and leverage in information and knowledge management investments.
- *Knowledge Management Over Time-Varying Geospatial Datasets* focuses on integration of spatial data collected by many government agencies in various formats and for various uses, thus providing for new uses; includes development of a knowledge management framework to provide syntax, context, and semantics, and explores the introduction of time-varying data.

3.4.3 Australia

As will be seen later in this book, one of the important research themes identified by

the project team is how to assess the value of ICT in government. "Value" covers both financial returns and the social benefits to citizens. Australia has already initiated two ARC funded projects to consider both the financial and social values from ICT:

- *The key strategies in firms' realisation of value from ICT: A transformational model of ICT value generation.* Studies indicate that ICT has contributed significantly to Australia's productivity gains over the last decade. It is not well understood, however, why some firms and some industries have been able to benefit significantly more from ICT use than others. This study will show the strategies and practices that are used by the firms that gain maximum benefit from ICT - the 'ICT winners'. Government agencies have been included in this research.
- *Online advisory systems.* Two projects are investigating the benefits to be gained from government online advisory systems; and the design principles of such systems, using taxation law as a prototype.

3.5 Research programmes and strategies in legal and economic issues

Many eGovernment initiatives present new legal and economic challenges. Typically the economic challenges are likely to focus on new models for economic efficiency in the globalised market; and the legal challenges could address the governance issues arising from this economic environment. Both the EU and Australia have started to address innovation and change in the public finance arena, but in different ways.

3.5.1 Europe

Several national strategic policies and documents are addressing co-operation between the public and private sectors in order to outsource certain services and to spur innovation. This last objective is strongly related to the Lisbon objectives for jobs and economic growth. In the course of globalisation and increasing competition, eGovernment has been recognised as a crucial factor in helping nations to survive in a competitive environment (Chevallerau, 2005). Besides addressing citizens, governments also focus on developing and providing public eServices, but with an increasing shift towards business organisations in order to attract foreign investors. Hence it is not surprising that governments at the national and the EU-level focus on eProcurement and ePayment.

With the aim of improving their efficiency, national governments have established quality management initiatives for different eGovernment tasks. Some new Member States, for example the Czech Republic, Bulgaria, Estonia, and Lithuania, have initiated eServices for businesses first; eServices for citizens will follow on from this (IDABC, 2005).

3.5.2 Australia

As mentioned in section 3.2.4 above, the ARC has provided substantial funds to help universities to establish a number of multidisciplinary research networks. Two of these networks cover research into legal and economic issues:

- *The Governance Research Network (GovNet):* Institutions and their governance are frequently part of our most pressing problems - not least in our national research priorities. Hence, institutions are invariably a key part of the solutions. GovNet unites three ARC Centres, two existing networks and several other dynamic centres to create an interdisciplinary network of ethicists, lawyers, political scientists, economists

and historians. It will tackle issues of institutional governance, from small firms to global institutions, recognising both common governance issues and radically differing contexts. Together with the Asia-Pacific School of Economics and Government (APSEG), and government agencies, it will apply cutting edge cross-disciplinary, theory-driven, evidence-based research to governance issues in the region.

- *Financial Integrity Research Network (FIRN):* The integrity of the financial system is constantly under stress because of the development of ever more complex financial instruments, structures and strategies, and the associated research technologies that continues to accelerate worldwide. FIRN's vision is to harness the considerable strengths of Australia's internationally renowned finance, accounting and economics researchers into a research agenda to address issues concerning the integrity of the financial system.

3.6 Research programmes and strategies to investigate society evolution

Much of an eGovernment transformation is dependent on changes and movements within society. While some citizens engage information technology in their own lives other cannot or will not. Understanding how ICT affects personal and civic choices can add insight into learning about the impacts of eGovernment initiatives.

3.6.1 Europe
A main objective the EC in the next few years is the development of an inclusive information society and an improved quality of life (European Commission, 2006a). To reach that goal, citizen empowerment has been identified as a crucial factor (European Commission, 2003). Many existing studies emphasise the need for socio-economic research into ways to empower citizens to participate in the information society. Particular attention needs to be given to support life-long learning through the development of eLearning methods and systems. In particular, the needs of an ageing society, and of people with special needs, should be taken into account (European Commission, 2006a). Although it is well aware of the need for citizen's empowerment, current EU approaches to counteract the threatening digital divide still mainly focus on equipping people with ICT instead of investigating further the barriers that prevent citizens from using ICT. For instance, having the right ICT equipment and being able to use it, does not automatically mean that someone is knowledgeable about a certain eService.

In the course of developing an inclusive European information society, eParticipation becomes more and more a topic of interest. Looking at national eGovernment research strategies it appears that Member States from southeast Europe do not promote eDemocracy, eParticipation and eVoting to the same extent that Member States from the other European regions do. In addition, ambient intelligence and eHealth services are further research themes. Challenges to be addressed are ways to understand the social characteristics of the health domain and ways to develop innovative socio-technology applications. This will entail the development of technical standards and guidelines to ensure compatibility, interoperability, scalability, and reliability.

3.6.2 United States of America (USA)
In the USA, there are organisations that focus primarily on learning how information technology has affected and will affect society and culture. The Pew Charitable Trusts

is a non-profit foundation that sponsors the Internet and American Life Program which explores the impact of the Internet on Americans and disseminates research-based information on the Internet's growth and societal impact. Recent work has addressed broadband adoption, on-line activities, social networks, and the demographics of Internet use. Also, the Markle Foundation is a non-profit organisation that focuses on the impacts and potential of information and communication technologies to change people's lives. The Foundation conducts research and social change projects in partnership with selected collaborators from the public, private, and civic sectors. Its current priorities are health care and national security.

Also, examples of NSF funded projects that that have more of a civic and societal perspective include:

- *Policy Made Public: Technologies of Deliberation and Representation in Rebuilding Lower Manhattan.* This project examines how old and new advocacy groups are adapting to new deliberative technologies that may challenge traditional mechanisms of citizen participation in public policy decisions.
- *Digital Government: Harvesting Information to Sustain Our Forests.* An initiative to design and prototype an "Adaptive Management Portal" to make information available in an open, natural and useful way to all parties interested in forest lands.

3.6.3 Australia

There are two projects funded by the ARC which broadly fall into the area of social evolution. One project explores some of the positive and negative cultural aspects of the introduction of ICT. The other project investigates some of the social aspects of electronic health records, an important study because of the widespread interest in eHealth in many countries. Details of the projects are as follows:

- *Liberal Machines: Information poverty, political culture and the uses of new communications technologies.* This project examines two contentious issues in scholarly and policy debate: the nature and consequences of information poverty, and the consequences of new communications technologies for western political culture. Rather than focusing on the emancipatory potential of new technologies, we see these problems through the prism of liberal government, its history and prospects. In particular we are concerned with liberalism's longstanding concerns with security, civil peace, freedom, and disadvantage. We explore contemporary developments in electronic government, digital media, online learning, cyber-democracy and wired communities. The result will contribute to our understanding of the political and intellectual uses of information technology.
- *Invoking consistency of meaning in data integration and extraction for electronic Health Records.* This project is a cooperative effort between academia and the NSW Health Department, as a partner. Many governments want to implement an Electronic Health Record. Such a Record is a summary of events in an individual's medical history derived from diverse medical databases. Only some summaries are relevant to any medical condition. This project is to address these converse issues of data integration and extraction. Summaries must have variable structure according to event, and must be consistently drawn from datasets which have consistent meaning. The project will extend a formal mathematical approach successfully developed for checking conformity of databases. NSW Health Department is a partner because the outcomes represent a step toward a practical Electronic Health Record.

3.7 Other initiatives fostering eGovernment related research

In this section we take a closer look at initiatives fostering eGovernment related research by organisations other than governments. The OECD and the UN are chosen to represent non-government organisations, and the European Information and Communications Technology Association (EICTA) will represent the ICT industry point of view.

3.7.1 Organisation for Economic Co-operation and Development (OECD)

One research focus of the OECD, relevant to eGovernment, is on reducing administrative burden, with particular emphasis on how to achieve administrative simplification, and how to measure the progress in achieving it (OECD, 2007). This OECD research found that previous administrative simplification was often carried out on an ad-hoc or sectoral basis. Today, most OECD countries follow a holistic government approach in order to reduce administrative burdens. Yet, governments still give more emphasis to reviewing existing regulations than to reforming them. The OECD came to the conclusion that basic approaches to administrative simplification are single access points to public eServices, and business process re-engineering.

By scanning the eGovernment project website of the OECD (OECD, 2005a), it is notable that the OECD's eGovernment research is driven by a strong economic focus. Hence it is not surprising that eProcurement is the main topic of interest. Besides efficiency needs, further driving forces for eProcurement are increased transparency, integrity, and accountability in public procurement, to help prevent corruption.

Further, the OECD promoted the project WiMAX (Worldwide Interoperability for Microwave Access), to support long-distance wireless connectivity for broadband access and interoperability (OECD, 2005b). WiMAX aims at overcoming the digital divide by reducing costs and therewith prices, so that citizens can afford this standard of access. Research focus is on interoperability and the lack of economies of scale. Long-distance wireless links will lead to higher-speed services for rural areas that are not connected to fixed-line networks. Another service will be the provision of mobile connectivity over shorter distances. WiMAX is likely to become a key component of next-generation coupled or ubiquitous networks, and would support the OECD's emphasis on the role of ICT in the citizens' involvement in the decision-making process (OECD, 2001).

With regard to the emerging information society and threatened digital divide, the Centre for Educational Research and Innovation (CERI) has a focus on eLearning in tertiary education and training (CERI, 2005). CERI wants to answer the questions - "Will eLearning as a trend continue?", and "How could governments and institutions help make further progress in eLearning and bring in all of its potential benefits?".

The Working Party on Information Security and Privacy (WPISP) of the OECD focuses its research on authentication (OECD, 2005a). In detail, mechanisms to link different legislative, legal and policy frameworks, to provide for cross-jurisdictional authentication, will be developed. The activities will promote the use of authentication as an integral element of a safer, more secure Internet, especially for financial transactions. The development of authentication solutions will also be related to other issues such as online identity theft, management of digital identities, spam, travel security, biometrics, etc. Special attention should also be given to research to overcome the drawbacks of new authentication technologies. In order to facilitate interoperability of security, and identification and authentication mechanisms, it is claimed that the focus needs to be on the development of tools at the technical level, and on common standards. Likewise, a cross-border com-

mon regulatory framework, in particular regarding the recognition of foreign authentication services and the acceptance of certificates of other providers, is stressed as a need. Furthermore, a framework for assessing the characteristics of authentication methods should be developed to evaluate the degree to which security, identification and authenticity solutions meet the needs of a particular application.

The OECD (2004) also promotes the further development of technical defence measures against spam. Research should take place in the fields of network management solutions for spam defence, and into ways to reduce spam through mobile and instant messaging devices.

3.7.2 United Nations (UN)

With regard to the policy debate in intergovernmental bodies, the UN General Assembly (UNGA) set up Resolution 59/288. It promotes a procurement reform in governments and public agencies (UN 2005a). Increased efforts will be undertaken to improve the efficiency of procurement by reducing redundancy, and harmonising the procurement procedures.

In addition, UNGA promoted Resolution 58/199 that encourages national and international research and development initiatives to create a general ICT security culture and protect critical ICT infrastructures (United Nations, 2005).

The UN recognised an urgent need to further develop existing ICT to build early warning systems to forecast natural disasters, and to deal with them effectively (United Nations 2005b). Also, there is a need to promote better understanding and knowledge of the causes of disasters. Coping capabilities must be built and strengthened through transferring and exchanging experiences and technical knowledge, and by providing access to relevant data and information, as well as strengthening institutional arrangements, including community-based organisations. Governments should establish national platforms or focal points for disaster reduction, and in particular encourage platforms to share relevant information on standards and practices, and strengthen these platforms where they already exist.

With an eye to the future of eGovernment in the global context, the United Nations has shown strong support for the use of ICT in government in the Asia Pacific region, and has established the Asia Pacific Development Information Programme, including a portal to Asia Pacific eGovernment websites (United Nations, 2007). This programme is not specifically for research into eGovernment, but it indicates that by 2020 there could be some countries in this region that will be capable of participating in a wider electronic government and governance network.

3.7.3 eGovernment and ICT RTD from the ICT industry

The European Information & Communications Technology Industry Association (EICTA) commends the objectives emphasised in the EU Ministerial Declaration (EICTA, 2005), namely: no citizen to be left behind - thus inclusion by design; contribute ICT support in order to realise effective and efficient government; design high impact services with regard to customers' needs; and provide, as far as possible, trusted access to public services across the EU through mutually recognised electronic identifications. Hence, the ICT industry supports the development and research foci as set out at the EU level.

In the USA, the IBM Endowment for the Business of Government sponsors and publishes research that pertains to improving government operations, including eGovernment themes. Several small grants (approximately $20,000 (€14,900) each) are awarded twice a

year on a competitive basis. Funded projects are published and disseminated in print and on the web. Recent eGovernment research projects include studies of government use of RFID technology and data transmission standards for elections administration, electronic signatures, and eGovernment performance measurement.

3.8 Current trends in eGovernment research

In order to build future scenarios and a well founded roadmap to 2020, a review of current trends and existing studies on foresight methodologies has been carried out. The most relevant trends extracted are briefly described here.

3.8.1 ICT related trends

Research already focuses on nanotechnology, information technology and cognitive science. It is assumed that these sciences are possible future mega-trends in technology developments. According to Compano and Pascu (2005), in particular the convergence of nanotechnology, biotechnologies, information and communication technologies and cognitive sciences will impact the future research landscape.

In regard to globalisation, a successful development of automatic translation machines is likely to progress, which will help to bridge the barrier between people speaking different languages. Mettler (2005) forecasts that these machines, and many more developments in relation to the use of ICT, will facilitate the ability to grasp, memorise and intelligently infer knowledge from anywhere, which will probably lead to collective intelligence.

Peterson (2005) has identified the following general ICT trends and research needs for the years up to 2020:
- Research efforts on everything related to, and which can adapt through the use of tele-mediation including tele-presence, tele-medicine, and tele-education;
- Constant and sustainable monitoring and surveillance, through the use of the technique of coherent change detection;
- Information overload will require autonomous data organisation, analysis, filtering, and prioritisation of 'findings';
- Information accessibility for all who need massive amounts of archival and near real time information;
- Information modelling including large complex systems modelling and simulations like geo-forewarning information systems;
- Information security and encryption; and
- Cooperation, integration, interoperability, knowledge management.

Lloyd (2005) also forecasts a complete integration of TV and computer communication technologies.

3.8.2 Trends in legal and economic issues

Modis (2005) uses the S-shaped curve of natural growth to predict that the number of Internet users in the EU will flatten out in about 2010, at 48% of the population, and little further Internet penetration would be expected after that date. The high penetration already achieved by some EU Member States (e.g. Denmark and Iceland) could mean there would be much lower levels of penetration in other Member States. If Modis's prediction is valid, it may need more consideration. If there is less than 50 percent Internet

take up within the whole of the EU or within some individual Member States, research will be needed into how the rest of these populations will access their eServices, if not by the Internet.

To achieve the EC objective to become the world's leading Information Society still requires substantial deployment and use of ICT. Skulimowski (2005) surmises that the new EU Member States will implement the necessary ICT infrastructure until 2020. Also, these new Member States, as well as the candidate countries, will implement more eGovernment services for business than for individuals because of economic reasons. This implies that trust and security in particular will still be at the centre of research, to allow secure trade in the new economy of eBusiness and eCommerce (Compano and Pascu, 2005).

3.8.3 Trends in government modernisation

Buhigas-Schubert and Martens (2005) expect that societies will change in such a way that, on a global scale, the importance of regional structures will grow, and regions will work more closely together, potentially sharing services and infrastructure. This implies the need for new governmental structures and cooperation across borders. Thus, a trend to reconstruct government at all levels could occur. The European Union itself is the best example of such a development.

Gartner, a large global ICT consulting company, developed future scenarios and identified and assessed the following trends for eGovernment 2020 (Di Maio et al., 2005):

- The provision of a single point of contact is not fully realisable, because intermediaries are central for service delivery and will inhibit it.
- Smaller and more active governments will occur by pooling at the inter-agency level, thus reducing local responsibilities and efforts.
- Responsibilities and resources will significantly shift between different tiers of governments, whereby data analytics and business intelligence play a major role.
- A greater consolidation and shared services to support integration will occur, in order to be more efficient, or to satisfy an increasing reliance on external service providers.
- There will be no single system for government-controlled identity management because of privacy concerns, or because of the established role of intermediaries in service delivery.

3.8.4 Trends regarding society evolution

It is fairly certain that the trend of the increasing infiltration of ICT into all areas of life will continue. However, it could also lead to the social exclusion of those who choose not to, or are not able to take part in the new Information Society, for whatever reason.

In addition, the threat and existence of the so-called brain-drain can be recognised in many places in the world. In particular, within the EU, Buhigas-Schubert and Martens (2005) have identified the potential risk that a critical number of well educated researchers might leave their countries for reasons such as higher salaries elsewhere, or an unattractive research environment at their home university. They could claim more funding for research and development as an inducement to stay.

The European Commission maintains a thematic network on Foresight on Information Society Technologies in the European Research Area (FISTERA), to exercise future predictions for IST. FISTERA studies expected IST research trends for the timeframe of several years – depending on the methodology used. For example for the development of the Information Society, Compano and Pascu (2005) and Skulimowski (2005) identified three main socio-economic indicators, which will impact the success of the transforma-

tion process: The first aspect is related to the ageing society and the pressure to provide basic social security services. In particular some EU Member States, e.g. Germany and Italy, face this problem. At present, affected governments have started to focus on the future solutions to this matter. In this respect, eHealth is identified as being trend-setting. The second point is related to the need for life-long learning in order to empower people to handle ICT in all situations. Promotion and support of eLearning with adequate infra-structures, and the development of new methods of online learning are identified as ways to overcome the threatened digital divide. In addition, the positive attitude towards post-secondary learning, from tertiary scholar indicators, will continue. The third development is the growing mobility of the workforce, which will lead to new working structures, meth-ods and devices.

The next chapter introduces how regional experts look into the possible futures of eGovernment in 2020. The state of play analysis served on the one hand as general input for the scenario-workshops. On the other hand, the results were used for the comparison in the gap analysis (cf. chapter 5).

4. Scenarios of governments in 2020
Authors: *Marijn Janssen, Maria A. Wimmer, Melanie Bicking, René W. Wagenaar*

4.1 Motivation and scope of scenario-building

   The main trends and key research and implementation foci captured in the state of play were a major input to the scenario building. In the regional workshops, these trends and key foci were presented as fruits for thoughts for generating visionary images on future governments' activities, on their interaction with the constituency and on their use of innovative and newly emerging technology. These inputs ultimately resulted in the development of scenarios, which represent a set of coherent, alternative visions of the future for society, government, and ICTs in 2020. As already mentioned in chapters 1 and 2, these scenarios are the main sources for the subsequent gap analysis and development of the eGovernment research roadmap.

   The scenario approach is a suitable way to describe different futures and to reveal and analyse the different dimensions that make up possible different futures. Seven regional workshops with 140 experts from governments, ICT industry and consulting, and academia were conducted to stimulate interaction and creativity in order to derive scenarios. Twenty-nine scenarios were generated in the regional workshops resulting in the overwhelming number of 159 dimensions impacting different futures. Table 5 gives an overview of the workshops facts.

Table 5: *Facts sheet of the scenario-building workshops*

Country	City	Number of scenarios	Government	Academia	IT Industry & Consulting	Total	Europe	USA	Australia	Asia
			Participants scenario-building workshops				Geographical spread by continents			
Czech Republic	Prague	4	1	13	1	15	15			
Germany	Koblenz	5	2	13	4	19	19			
The Netherlands	Delft	4	4	7	8	19	19			
USA	San Diego	4	2	23	1	26	7	17		2
Lithuania	Vilnius	3	5	8	5	18	18			
Austria	Linz	4	11	9	5	25	25			
Slovenia	Bled	5	2	12	5	19	18	1		
Total number of participants		**29**	**27**	**85**	**29**	**141**	**121**	**18**	**0**	**2**

   A validation workshop was held to extract the main dimensions which were further clustered in three key axes resulting in a set of final eight scenarios as extremes along those axes.

   The workshops were carried out in the period of April – June 2006.

In the following sections, a summary of results of each workshop and an abstract of each scenario are presented. Thereafter, results from the validation workshop are reported, subsequently followed by a discussion of the main dimensions of the 29 scenarios as well as regional differences in visions, and the presentation of the final eight scenarios. A more detailed report of the results is available online (Deliverable D 2.1, 2006).

4.2 Results from the regional scenario-building workshops

4.2.1 Prague workshop
The first workshop was held in Prague in conjunction with the Eastern European eGov days. In total, 14 experts representing 6 European countries and mainly coming from the academic world attended the workshop. During the workshop, the group was split up into four subgroups creating four scenarios. The scenarios can be summarised as follows:
1. *The ambient government of Europe*. In 2020, society has changed and has grown older. Government is ambient, providing basic services for all, but the private sector gained more power by delivering extended services for those who can afford them. The democratic system has been eroded and there is a large divide between the haves and have-nots.
2. *Sustainable and pervasive governments*. Government services and participation in policy-making and law enforcement (whatever) are accessible whenever and wherever and are ambient. The public sector delivers services in all areas. Governments participate in communities to ensure close relationships with their citizens. The EU has grown strong and social systems have grown even stronger. A high-quality education system is the major factor to ensure nations' competitive advantage.
3. *Government as industry puppet*. Government is fragmented and performs a limited number of functions. Almost all service provisioning is left to the private sector. Industry rules the world and influences policy-making to a large extent. The EU is fragmented and weak. Privacy is sacrificed for business purposes. Businesses have a large influence on politicians and their decisions.
4. *Orchestrating government*. Government is primarily aiming at understanding the needs and wishes of their constituencies and on coordinating the fulfilment of their needs. There is a small and lean public administration aiming at directing the implementation, execution and enforcement of policy-making. Most functions are performed by the private sector within the policies and conditions set by governments. There is an emphasis on collecting and processing information to improve policy-making.

4.2.2 Koblenz workshop
The second workshop was held in Koblenz, Germany. In total 19 experts participated, coming from governments, research, ICT industry and consulting The following five scenarios were developed:
1. *A brave new world*. In 2020, the population's need for more security in Europe has led to a kind of brave new world in which government deploys more and more ICT supported control and monitoring mechanisms in order to satisfy this exigency. Citizens and businesses are under strong regulation and values like privacy protection are subordinated to the public welfare. Understanding citizens' needs is unnecessary, because public services are not provided to satisfy citizens. Instead, the fundamental values are to set up the best possible security standards.

2. *Active state*. In 2020 Europe's economy is weak and brain drain erodes it more and more. An ageing society and knowledge society lead to digital divide. Many public services are provided by the private sector. Privatisation and capitalism determine Europe in 2020. People work till the age of 75.
3. *Cooperative state*. In 2020, all federal systems have a central decision-making policy, whereby federal and state institutions cooperate very closely. Public and private sector have developed many cooperation and collaboration structures. The public sector is responsible to ensure public service provision, yet the private sector implements and offers them. Personal data is requested and stored at a minimum level. Data specification is based on gratuitousness.
4. *Liberal night-watcher state*. Governments provide and supply the minimum of public services. Individualism and personal responsibility are the most important values of society. Governments evolved to distressed institutions and the private sector performs most of its functions. Through a high degree of self-administration and self responsibility, "elbow society" rules the world.
5. *Divergences and parallelism.* Private interests are more important than public welfare. Knowledge society leads to a strengthened two-class society. Administration is minimised and technology is seen as instrument to solve problems of society.

4.2.3 Delft workshop
In the third workshop held in Delft (NL), 19 experts from national and local governments, NGOs and ICT consultancy, as well as academia participated. The workshop was supported using an electronic meeting system (Group Support System), and the following four scenarios were developed:
1. *Ferris wheel.* Ample opportunities are created by using technology. There are many ad-hoc actions to leverage the advances of technology and much of eGovernment is outsourced in open markets. Some centralised systems are developed and operated by government. Local customisation becomes the main role of local government. Monitoring of almost everything is possible and laws and regulations are immediately enforced. There is a large innovative EU, and an accepted privacy policy resulting in stable growth.
2. *Dodgems (cars)*: Innovation is based on heavy competition. Brokers and agents take care for the dynamics and the interplay of government and businesses/citizens. A highly complex market emerged, with no single dominating large ICT-player. Open source is mostly used. Community-based innovation and development happens, where IPR is ensured. High investments are done in ICT. Niche players innovate. Neither UN nor EU exists. An ICT-arms race takes place to develop cyber crimes, viruses, bio and smart weapons. With advanced anti-crime-ICT, fast reaction to crises and events is possible. Media plays an important role and it cannot be muzzled.
3. *Carousal*: There is limited economic growth and most people are satisfied with the situation. Society is ruled by common sense instead of emotions and there are no hypes. IPR is ensured and the winners on the software market take it all, ICT is only used to solve real problems and the media are critical toward politicians and decision-making. There is a large focus on privacy and security. Governments have achieved operational efficiency. Developments are based on a coherent long term vision and perspective, with a predictable impact of ICT.
4. *Roller coaster (in the dark):* The world is characterised by incidents and religious conflicts. Crisis management systems have become the most important systems. And

the EU is disintegrated. All decision-making has a short term focus and is based on opportunism. Each country has its own, closed systems. Local governmental powers compete with each other and there is a low economic growth. Regional distinction is important to remain attractive. Much social tension among communities exists, with limited trust in each other, no avatars, and the media is put a muzzle on.

4.2.4 San Diego workshop

The fourth workshop was held in the USA and was associated with the International Digital Government Research Conference in San Diego. 27 experts mainly from academia and from ten distinct countries developed the following scenarios:

1. *Demographics Rule*: In 2020, elder people will command an increasingly large proportion of public services, especially healthcare. This generation will also control a huge proportion of the wealth of Western societies. This will be accompanied by massive migration of young workers from other parts of the world to meet the economic needs of many countries. Government will play a major role in allocating services, such as healthcare and balancing the needs of different segments of society, particularly different age groups. Except for specialised functions, central governments will recede in importance and local governments will become more important. Regional levels of government will become increasingly irrelevant. Small, ubiquitous, wireless technologies will make information and services widely available, but at the expense of personal privacy because a network of sensors will record all kinds of daily activities.

2. *Global networked synchronous and ubiquitous mobile government:* The essence of this scenario is that technology has made geographic location irrelevant. Citizens move across borders freely, government does not restrict access and citizens take part in all decisions that affect them. Government takes on a moderator and gatekeeper role. Biometrics as a form of identification is commonplace. Smart cards, sensors, mobile technologies of all kinds abound.

3. *Local wins: The Me, I, My World of mass self-segregation:* After years of increasing globalisation, and a blurring of sense of place, people react by self-selecting into communities of "sameness" using ICT to keep them connected to (but still apart from) the rest of the world. In this scenario, everyone has access to technology therefore every person can select the community of interest he/she wishes to be associated with. People migrate to these communities with ease and may choose to live in small enclaves composed of people who are most like them in terms of interests, economic status, religion, etc. All their face-to-face interactions take place in these small units, all other interactions, including those with governments take place virtually. Citizens can choose which government they wish to interact with and obtain services from – a person living in one place could choose to pay taxes and take advantage of the services of a different place. Governments thus compete for citizen attention and support.

4. *Strong nomadic individuals*: Central government has become weak except for special functions like security and defence. Government no longer has strong ties to individuals' daily lives. Ubiquitous data stores are accessible by everyone, everywhere. High quality education is widely available through eLearning programmes devised for you as an individual. Although people have great personal freedom and mobility, they no longer have privacy as sensors are everywhere and personal data is traded outside one's control. Individuals therefore bear a heavy burden to find the information they need and manage the data and technology of their daily lives.

4.2.5 Vilnius workshop

The fifth workshop was held in Vilnius with 18 experts (consultants, researchers, and 11 representatives of ministries and other government organisations). Three groups developed the scenarios as summarised below:

1. *Human centred government*. In 2020, the EU Member States have grown closer together. EU-wide seamless data exchange occurs. Governments provide user centric services in a fully automatic fashion. Individuals belong to multiple, global and diverse communities of interest. People are globetrotters and continue to learn from anywhere. Privacy is well understood and well protected. Participation is not only possible through voting but via the electronic exchange of opinions and feedback. There are technologies to direct and manage the information-overload.
2. *The new eWorld order.* The EU has expanded to the east, and seamless trading with Russia as part of an extended Schengen Agreement takes place. Virtual territories make up borders and new voting rights. The world is divided between democratic and non-democratic countries. Privacy is made content-dependent. Government innovation is mainly coming from businesses, government focuses on providing standard services. The end of political parties and representative democracy is envisioned, and participation has both a central and local focus, with the rise of many horizontal virtual communities. Interoperability between EU-countries and between EU, central and local levels of Government is accomplished.
3. *Collaborative and highly networked society*. The hierarchical system of society is flat. Communities of interest are used to support participation in policy-making. The biggest threat comes from options of total surveillance and usage of "black technologies". Partnerships between different interest groups are organised via networks. Problems such as social divide have to be managed: only an elite group has possibilities to participate in serious decisions leaving the grassroots people only simple and irrelevant ones.

4.2.6 Linz workshop

The Linz workshop was adjoined to the annual ADV conference. It was the sixth in the series with a participation of 25 experts (11 from governments), which generated the following four scenarios:

1. *Knowledge based society / self administration*. The political climate and institutional systems have changed totally. Society, businesses and governments are based on knowledge management. Self-administration is realised to a high degree, and education is a collective task.
2. *Polarised Society*. Education is seen as a resource like water. The pressure to learn as much as you can is extremely high and leads to a two-class society. Simple work is automated and there is high migration into cities. Globalisation leads to overall standardisation. The economic scope is low.
3. *Mature (e)Government in the united federal states of Europe.* Europe's Member States closely work together. National thinking has been replaced by European thinking. Technology is used everywhere and is part of daily life routines. 'Electronic' government no longer exists; ICT usage and automation just have become ordinary government routine.
4. *Privatised zero-stop-shops and media-'democracy' in the Babylonian tower of Europe*. Citizens' rights of freedom are restricted. Digital divide mostly exists in the form of social divide and splits society. Democracy becomes more and more a me-

dia-'democracy'. Public administration is mostly automated but rigid. Multinational companies have an increasing influence on society. Privatisation of public services leads to less jurisdiction and quality. Biometric identification and implanted RFID systems serve as passports.

4.2.7 Bled workshop

The seventh workshop took place in conjunction with the 19th Bled Conference. 19 experts (major part from academia) generated the following five scenarios:

1. *Large organisations dominate*. Large local organisations have gained very strong political power and, consequently, exert a very high impact on the society and governments. No elections of political representatives take place, and no lobbyists are needed. Instead, the citizenry votes in direct democracy on issues to decide. Government services are strongly ICT-supported, highly personalised with the use of "Personal Brokers", and mainly offered by private entities.

2. *Technology Driven Society*. Technology exerts a strong impact on society and governments, which is driven by the restricted availability of energy and resources for the society. As a consequence, governments have become fully virtual governments. New ICT is invented, which enables operation with very low energy consumption. Privacy has diminished, although required by citizens – the trade-off between privacy and better services is decided in favour of the latter.

3. *More power to the European Union, less to the nations*. The environmental pressure increased dramatically due to aspects such as shortage of resources (water, energy, etc.), climate change, and it requires strong countervailing power. Massive migration takes place due to the climate, demographic and political tensions. Only talented immigrants are welcome in European Union countries. China and India are basically willing to change their legal and political systems towards more democracy and respectful handling of individual rights in order to reduce emigration. Advanced capabilities of problem solving are supported by technologies of intelligent information and data mining, where privacy is completely eroded.

4. *Individual eGovernment*. ICT has fully become part of our every-day life. Governments, citizens and private enterprises are ubiquitously interconnected through ICT systems anytime. Therefore, government provides individual services based on high data accessibility. Citizens and businesses are not concerned about strong data protection as long as benefits are higher than drawbacks.

5. *Central EU Government frame with local self-organising operational governments*. Unique social and identification systems exist. Central EU government is playing an important role. People become very mobile and move a lot. Unique devices are used to observe / monitor people. Governments influence in terms of procreation, e.g. genetic management of society. Central European government is playing a minimal, but important role. At local level, self-organising Governments exist with strong influence, and with a strong participation in Democracy.

4.3 Validation workshop

In the validation workshop, the results of the regional workshops were analysed and synthesised. The project partners first presented the 29 scenarios including the placement of the issues in the uncertainty/impact matrix in the individual workshops. On

this basis, the project partners extracted the main topics of interest and dimensions emerging from the number of scenarios (see Table 6). Partners scored them on the level of uncertainty and impact, and then discussed them along the three thematic clusters also used in the regional scenario-building workshops.

Table 6: *Issues identified in the validation workshop with high relevance for future eGovernment*

Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
Ageing in Western countries, consequently lack of workforce leading to migration and impact on world economies; Shift in political power; Changing role of local governments; European citizenship; Global citizens; Trust in government, in the market and in technology; Authentication and identity management; Knowledge and information availability and access; Social and religious tensions; Collaboration in crime prevention;	Service provisioning in the public sector; European service centres exist; Citizens insist on their choice of channel to interact with governments; EU has a strong role in strategic decisions on common aspects such as security, health, ageing, etc.; Regional governments and (new) innovative economic/societal clusters have emerged; eDemocracy and eParticipation; Changing public values in respect to Government services and activity; High importance of privacy and security in eGovernment services;	Interoperable infrastructures among government agencies are in place; including wireless infrastructures; Service oriented infrastructures; Technology convergence, ubiquity and intelligence; Ambient and inconspicuous technology; Universal digital identification and authentication; Increasingly using biometric data; New need for data and system security due to new cyber threats; ICT fully embedded in all aspects of life;

In the following, a discussion of the issues identified with a high relevance as introduced in Table 6 is provided along the categorisation of issues into three major clusters: Social and contextual environment; Governments and their stakeholders; and ICT developments in government contexts.

4.3.1 Social and contextual environment

The social and contextual dimensions, to which experts in the regional workshops assigned a high impact, have been confirmed by the project partners. In contrast, it was recognised that the uncertainty assessment varied a lot – experts had different opinions on the likelihood of issues to appear in the future. The dimension 'global citizens' has been assessed with the highest impact of all dimensions. Uncertainty was rated at medium level. Arguments for these assessments are that, on the one hand, it is expected that globalisation will continue and people more and more become globetrotters. On the other hand it is doubtful whether global citizenship can come true for every citizen.

The dimensions 'social and religious tension' and 'ageing' also received high impact rates. However, whilst 'social and religious tension' reached the highest degree of uncertainty of all dimensions, the dimension 'ageing' was rated with the lowest value for uncertainty of all dimensions. The participants expect that 'social and religious tension' will not be very likely to occur. However, if it will occur, it will have a high impact on future eGovernment. This judgment seems to be motivated by terrorist attacks over last years, e.g. September 11, 2001. No one expected such an attack, and since then, ICT research and development on security issues has received a much attention in eGovernment. 'Ageing' was assessed as a fact as this development is an extrapolation from the present and, hence, will have a high impact on the future: An ageing society affects the whole society, which means young, middle-aged and old people.

The next two dimensions having a high impact were 'Changing roles of local government' and 'Knowledge and information availability'. Both are more or less at the same level of impact but different in relation to uncertainty. 'Changing roles of local government' is at a medium level of uncertainty. Two scenarios were identified, and both would result in a change in local government: On the one hand, the trend to direct eGovernment service production and transformation to a citizen-centric approach was seen as an element strengthening local governments. On the other hand, Europeanisation might lead to less local government, which could even result in the abolition of local governments.

The following five dimensions were viewed by the participants more or less equal: 'European citizenship', 'Shift in political power', 'Collaboration in crime prevention', 'trust in government, market and ICT' and 'Authentication and identity management'. The dimensions 'European citizenship' and 'Shift in political power' have achieved the same impact and uncertainty values, and both values are relatively high. European citizenship is more uncertain than global citizens and is expected to have less impact. European citizenship is uncertain because the dimension is strongly related to current developments (referendums in France and the Netherlands resulted in refusal of the European Constitution). In addition, a shift in political power from middle-aged people to the older-aged people is uncertain, although an ageing society is expected. 'Collaboration in crime prevention' is a crucial topic in respect to the developments after 9/11. Experts esteemed the current citizens' value in Europe to tend to favour freedom over security. Trust in government, market and ICT also relates to Crime prevention. This dependency resulted in high uncertainty rates from experts, because the future transformation process may lead to diverging ends. Hence, also the trust dimension was assessed with high uncertainty: it is unclear whether trust will remain the same or whether trust will increase or decrease. In particular, trust depends also on the dimension 'authentication and identity management'. It is expected that authentication and identity mechanisms will be supported by ICT in the future. The uncertainty factor thereby is to determine, which ICT will be deployed, and how this will restrict everyday life.

4.3.2 Governments and their stakeholders

In the cluster 'Governments and their stakeholders', three dimensions were expected to have a very high impact: 'Service provisioning', 'European service centres will come to existence' and 'The role of EU in strategic decisions on common aspects'. The dimensions' degree of uncertainty varied totally, though. Changes in Service provisioning were highly expected in particular in the fields of quality of services and in the geographical distribution (regional vs. centralised provision). An average level of uncer-

tainty was assigned to the dimension 'European service centres will come to existence'. This dimension is closely related to whether government's institutional infrastructures should be more centralised or decentralised. In the scenario-building workshops, experts argued that some services of national, regional or local governments will be provided at the EU level in future. Yet, what kind of services these might be, and how the transformation might occur, was rated as uncertain. The dimension 'The role of the EU in strategic decisions on common aspects' was also seen as being closely related to regional and central distribution of competencies. Another interrelation among the three dimensions and their ratings is that the higher the aspect of power is, the higher seems also the uncertainty that it will be realised. It was noted that strategic decisions are very powerful and important competencies. Therefore it is uncertain if nations will agree to give up some of their power to the EC or to local governments.

The dimensions 'eDemocracy and eParticipation' and 'Regional governments and (new) innovative clusters' have more or less the same impact and uncertainty. For eDemocracy and eParticipation it is unclear if people will be interested. It is expected that if citizens have more direct influence on strategic and democratic decisions, they will take part in voting, which is easier to realise by a regional approach than by a central approach. The dimensions 'Choice of channel' and 'Changing public values' also relate to the Democracy and participation dimension. Likewise, experts stressed a strong dependency to the dimension Europeanisation (see section 4.3.1), i.e.: 'If Europe grows closer together, will we get a central administration? Many expectations depend on that question.' was the consensus of experts.

'Changing public values' and 'Security and privacy' dimensions achieved the highest values for uncertainty. In terms of Security and privacy, no big changes were expected in the future, because of the population's anxiousness concerning data misuse. Experts also assessed multi-channels for accessing government services as materialising in future with a high likelihood (low uncertainty). Hence, according to the experts' opinions in the regional scenario-building workshops, citizens will interact with the government using a variety of channels based on individual preferences and needs.

4.3.3 ICT developments in government contexts

The technology dimensions shown in Table 6 can be grouped into four areas influencing eGovernment in 2020:

1. *Ambient technology* covering the dimensions 'ICT really embedded in all aspects of life', 'ambient and inconspicuous technology', and 'Technology convergence, ubiquity and intelligence'. While the first two dimensions achieved a high uncertainty value and an impact value above medium, the latter was rated with the highest value of impact and a moderate uncertainty value.
2. *Digital identities* groups 'Universal digital identification and authentication' and the 'Increased use of biometrics'. Both dimensions were given high uncertainty values, whilst the impact values were assessed as high (higher than the dimensions grouped in ambient technology).
3. *Interoperability and infrastructures* covers 'interoperable infrastructures among government agencies', 'ubiquitous availability of wireless infrastructure', and 'Service oriented infrastructures'. These dimensions were assessed with a very high value of impact and an average value of uncertainty.
4. *Identification infrastructures* groups 'universal identification and authentication', 'Use of biometric data' and 'Need for data and system security as new cyber

threats emerge'. All these dimensions achieved a very high impact but less uncertainty than the 'Interoperability and technology' dimension.

It can be argued that, in respect to eGovernment, these technology dimensions must not be considered in isolation. Groups 3 and 4 seemed at present to be the most pressing in the public sector, and also the ones most predictable, since many investigations are already taking place. 'Digital identities' is also a group of dimensions currently already addressed in many respects. However, technology in this area is not yet stable enough, and there exist many organisational, legal and societal biases, which resulted in a higher uncertainty assessment. The ambient technologies cluster is with the highest insecurities in the likelihood axe. Basic technology research is taking place. However, how these technologies might impact eGovernment, and the likelihood if they will at all, cannot be esteemed. On the other hand since the knowledge and potentials about such technologies are not yet revealed, impact was only given a moderate value.

It should also be noted that the impact and uncertainty values in the technology dimensions were always in respect to their usage in the pubic sector activities. The most pertinent in this respect are the groups 2 and 4: they heavily correlate to the dimensions Trust in eGovernment, and Authentication and identity management in the social and contextual environment group; and they are strongly interdependent with the Importance of privacy and security in eGovernment services from the Governments and their stakeholders group.

Apart from that, the Interoperability and infrastructures dimensions are important conditions for eGovernment service provisioning, European service centres, and Citizens choices of channels to interact with governments. Likewise, this group of dimensions in the technology cluster provides a basis for Knowledge and information availability and access, as well as the Collaboration in crime prevention dimensions of the Social and contextual environment cluster.

4.4 Analysis of scenarios

4.4.1 Extracting core dimensions of the scenarios

For determining alternative futures, major focus was put on developments having a high impact (cf. methodology described in section 2.6). The high impact dimensions identified in the regional workshops and validation workshop were aggregated. Eleven dimensions appeared only once, whereas the most frequent dimension 'Government power' appeared 17 times out of a possible 30 times. A dimension could appear in one or more of the 29 scenarios and in the validation workshop. Figure 12 shows the most frequently mentioned dimensions.

The most named dimensions are heterogeneous in nature and refer to ongoing developments, requirements on government functioning, technology aspects, laws, organisational arrangements, changes in society, and world-wide events. Some of these dimensions are dependent on each other, like outsourcing of non-core activities and public-private partnership or interoperability standards and service-oriented architecture. To come up with a limited number of key dimensions to construct the final set of scenarios, the correlating dimensions were merged, which resulted in the identification of the following key dimensions (see also argumentation of correlations presented in section 4.3 before):

1. *Environment (stable ⇔ disruptive)*: The environment can either be stable or disruptive. A stable environment can be characterised by economic growth, a balanced world order, living in harmony. In a disruptive environment all kinds of crises
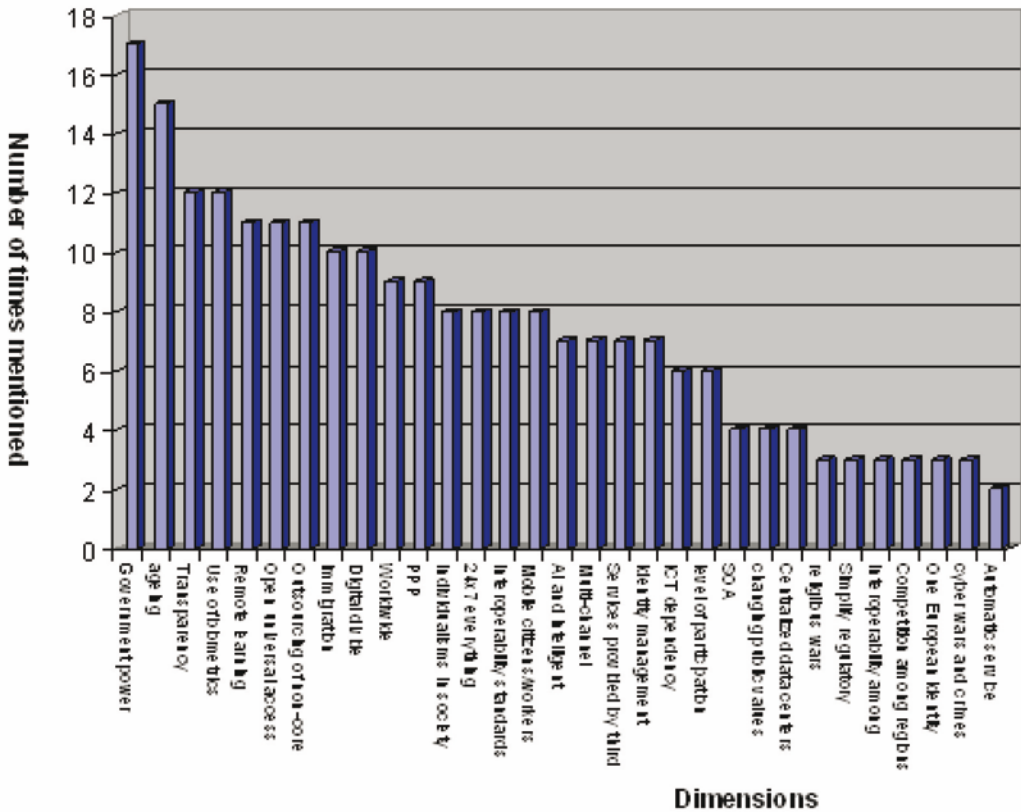
Figure 12: *Most important dimensions found in the regional and validation workshops*

and incidents occur. The war on terrorisms continues. Cyber crimes, viruses and bugs escape from labs. Religious tensions and wars do appear. And a large social divide exists resulting in riots.

2. *Attitude towards government (trust ⇔ distrust)*: On the one hand, citizens can have a positive attitude towards government and have faith in government. In this case, they trust that the government takes care of them. Individuals like to participate in policy-making and democratic processes and believe they can influence the outcomes of governmental decision-making, and they perceive the outcomes as fair. On the other hand, there might be heavy distrust in government. In such cases, the government is not transparent, decisions are hard to comprehend, the results of participation in decision-making are ignored.

3. *Government scope (all-inclusive ⇔ core business)*: Governments can either focus on their core business and leave as much as possible to the private sector (lean government), including social security, or have a large scope and provide as many services as possible. Governments focusing on their core business might determine laws, regulations and policies to guide and steer the private sector. Thereby, focus lies on core business, whilst as many activities as possible are outsourced to the private and civic sectors. Governments having a large scope and providing as many services as possible with the intention to be all-inclusive hardly outsource their ICT or business processes and try retaining everything in-house.
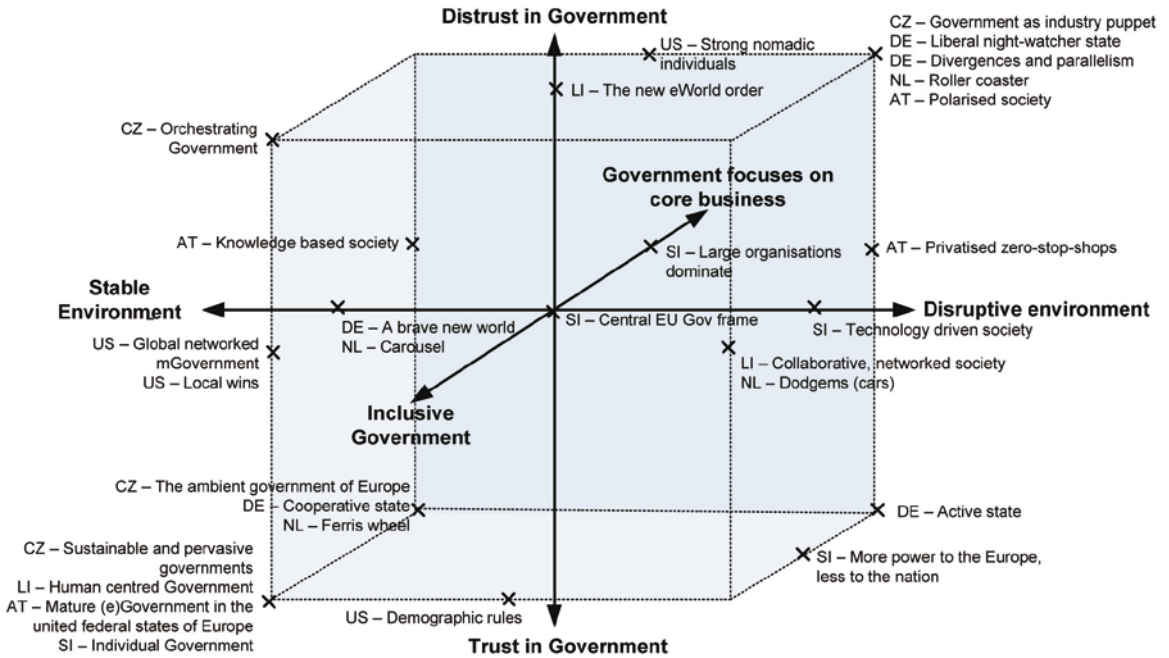
Figure 13: Placing the 29 scenarios in the main three dimensions – an indicative overview of experts' traces to futures

Relating the three dimensions among each other forms a three-dimensional space, within which the individual scenarios from the regional workshops could be placed. Figure 13 shows the 29 scenarios in this cube (Janssen et al., 2007b). It is interesting to note that experts see two main traces: either trusted governments that provide all inclusive service offers, and this in a stable environment; or governments are distrusted and provide only core services most probably because the environment is disruptive. These are the two main opposing traces to potential futures the experts embodied in the individual scenarios.

eGovernment innovations are expected to result from the use of foreseeable technologies within a certain context. One reason for this might be that disruptive technology cannot be predicted. Most of the participants expected that future eGovernment challenges would come from the changes in the societal and interaction environments which are more likely to determine the methods of monitoring, interaction, collaboration, policy making and enforcement. As such, the participants expected that societal changes and modernisation of government will primarily influence the different futures. Technology was viewed as an instrument to help solve problems of society.

The eGovRTD2020 scenario approach is grounded in the assumption that the future cannot fully be predicted: "if we know it already, it is no more the future", (cf. Popper, 1982) The 'real' future for eGovernment in 2020 lies in some combination of the wideranging possibilities elicited in the scenarios.

To develop a stable and comprehensive eGovernment research roadmap, it is important to consider the implications of the full range of future alternatives embodied in the divergent dimensions, which were extracted in the scenario synthesis. The scenarios help to draw attention to the variety of developments and visions that could be a potential future. For Europe, this variety should help policy-makers to leverage the potential of the diversity and take into account the differences when trying to transform the European government landscape into a coherent community. On a more global scale, the scenarios offer insights into broad social, political, and demographic concerns that will shape both government and society in the coming decades.

4.4.2 Regional differences

Although similar dimensions are mentioned in many workshops, there were also a number of typical regional differences, which are shortly discussed hereafter (a summary is given in Table 7).

The *Prague* workshop emphasised cultural differences in Europe, which may derive from the differences between East and West Europe (participants came from different countries of Eastern and Western European countries). Also the different attitudes towards risks might influence the future. This is in close correlation with the issue of privatisation of government: as in avoiding risks, governments will not likely outsource governmental functions and activities.

The *Delft* workshop focused especially issues of dependency with other countries in the world, e.g. economic growth, battle of architectures, impact of bugs and cyber wars. This might be due to the relatively strong dependency of small countries on the stability in the world and the growth of the world economy.

The *Koblenz* workshop dealt with many large-scale issues: e.g. will governments be able to process large volumes of data in the future and what of the Government activities will be executed centrally / decentralised in future. This could be attributed to the federal system of this country. Centralisation and data protection issues were among the most mentioned issues.

The *Vilnius* workshop focused on cross-border and trading issues. Especially the relationship with Russia and the other countries of the former Soviet Union were mentioned. Trading was closely related to how to ensure economic growth in the future. Also questions as to what will happen to politics of parties was considered an important issue in this workshop, which might be based on the region seeming to struggle with its democratic system.

The *Linz* workshops emphasised the various futures envisaging simplification and non-regulations of public administration. Also ageing, the lack of workforce and different ways to solve such challenges (e.g. robotics in healthcare) resulted in alternative futures.

In the *Bled* workshop, the regional aspects and community activities were viewed as important and as affecting the future. Instead of European or national focus, something in between was expected which resulted in all kind of different futures on aspects like government arrangement, trading, cooperation and so on. This could be derived from the need to cooperate with the neighbouring countries in this region.

The *US-workshop* held in San Diego emphasised the freedom and autonomy of the individual. The ability to decide on your own whether or not to be involved with government and making use of technology were in the centre of concern. The idea of Internet-free zones was introduced to underline the self-determination of individuals. These regional differences can be attributed to culture in this country.

Table 7: *Overview of regional differences*

Location	Key tendencies and foci of the regional workshop scenarios
CZ: Prague	Big brother effects
	Democratic system, government as industry puppet
	Establishment of infrastructure (hardware, Internet presence)
DE: Koblenz	Ageing, privatisation and capitalism
	Self-administration and responsibilities and dismissing role government
	Knowledge society and social (digital) divide
NL: Delft	Governments in international context (bugs, crises, viruses, worldwide economic decline)
	International competition (arms race, battle of architecture)
	Software market
LI: Vilnius	Focus on political system (party politics)
	Trading with Russia (expanding EU to East), customs
	Total surveillance and big brother
AT: Linz	Europeanisation (culture)
	Regulatory framework, holistic jurisdiction
	eHealth and robotics
SI: Bled	Focus on EU regions
	Individualism, extreme life-style, self-government
	Genetic management of society
USA: San Diego	Liberal visions
	The role of the individual dominates
	A natural distrust in government

4.5 Final eight scenarios

On the basis of an extensive analysis of the scenario dimensions of the regional workshops, and hooking on the identification of three core dimensions of scenarios (cf. section 4.4.1), the results of the regional scenario-building workshops (bottom-up approach) were transformed in a limited set of scenarios (top-down design). Three dimensions with two extremes each resulted in 2*2*2 = 8 stereotypical scenarios. Figure 14 depicts the eight scenarios in the three-dimensional space. The scenario names were as much as possible based on the peculiarities aggregated from the regional workshop results.

   The eight final scenarios provide a consistent and coherent picture of possible futures identified in the regional workshops. They can be communicated to non-experts, and were used as food for thoughts for the subsequent roadmapping workshop participants. In the following subsections, each scenario is described in terms of
   • An abstract;
   • The extreme values of the three dimensions;
   • Core issues in the three clusters of disciplines considered; and
   • A more detailed description of these issues per discipline cluster.
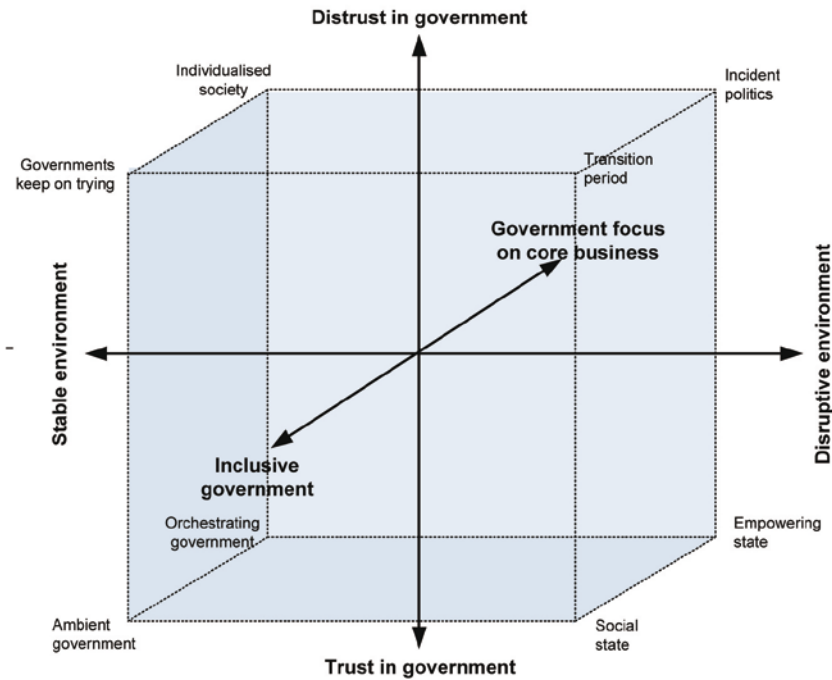
Figure 14: *Key dimensions and final set of scenarios*

4.5.1 Orchestrating government

Table 8: *Main characteristics of scenario "Orchestrating government"*

Abstract	Disruptive developments predicted at the beginning of the 21st century did not occur, or these had only a modest effect on societies. Because of the benign and stable environment, along with greater equality and productivity, government adopts a facilitating, but limited, role in society, which is broadly supported by citizens who turn to the private sector for many services. Technology does not dominate but serves to support interaction and coordination among different systems and service channels.

Aspects of core dimensions	Environment	Attitude towards government	Government scope
	stable	Trust	core business

	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
Key issues and dimensions	Inclusive society	Government focus on core business	Mobility
	Stable environment	No personalised services	eCrimes and eTerrorism
	Integration of ageing society	Transparency (Legislation)	Technical standards
	Europeanisation	Legal and social norms are not automated	Unique identity
	Trust in government	Outsourcing of non-core business (Public-Private-Partnerships) for	
		Cost efficiency	
		Service quality	

Social and contextual environment

The environment has not changed much over the recent decade. While several warn-

ings have been given about a potential social divide, terrorism, individual chances and power are fairly distributed between generations, income groups and people from different ethnic backgrounds. This is partly due to a society, in which broad layers of the population are acquainted with the use of ICT in daily life, including the elderly, who outnumber youngsters by a factor two. Though ICT and further European integration have increased the chances for mobility, people are reluctant to move between European countries and to give up the certainties they derive from belonging to a nation. Instead, they stick to a limited geographical area. The positive effects of European integration are clear, though. The European Union has been able to contribute positively towards a relatively stable world, in which religious wars have been settled, and feared highly agile cyber crimes have not developed into a serious threat to the provision of critical ICT infrastructures and services (e.g. semi-automated jurisdiction systems, identity management, remote monitoring, etc.). The general attitude towards the EU is a positive one, and a sense of European citizenship has developed ("proud to be European").

Being old no longer is an excuse to withdraw oneself from society, nor does society end its ties with people once they reach a certain age. People from older generations are still partially active as employees or entrepreneurs. Reforms in the social sector have stimulated life-long working, have rebalanced the income contribution of younger workers to the elderly, and have led to an increase in labour productivity. Hence, no major immigration has taken place. This is one of the reasons why the feared polarisation between population groups from different ethnicities did not occur. In effect, people are entitled to much the same chances, and economically are becoming more equal.

These relatively stable circumstances contributed to the fact that the overall feeling about government's capabilities to adequately settle important social issues is positive. Trust in government has risen. Part of the explanation for this effect is that ICT enabled government to be more transparent about decision-making, and well-informed and -educated citizens created a fourth democratic power all across Europe. Not the mass media, but individuals and organisations acting in their own interest demanded and enforced this transparency. Another reason why government is being trusted is that technical means to monitor the acts of citizens have not been used to their full potential. Enforcement of social and legal norms mainly is a human action, and has not been taken over by automatic procedures (although heavily supported by ICT). The Big Brother effect that ICT pervasiveness could have delivered did not occur.

Governments and their stakeholders

Government itself operates more and more like businesses do when it comes to the execution of their operational tasks. Non-core activities have been outsourced to private parties in public tendering procedures. Service provisioning around functions formerly thought to belong exclusively to the State's competence – e.g. the issuing of passports and the administration around speeding bills – still take place under the responsibility of a governmental body, but private parties are responsible for all its daily executions.

Also, many public tasks in the healthcare sector and around social security are being performed by the market. Although firm regulations exist that ensure a smooth and fair working of them, with specific attention to socially disadvantaged groups.

Initially, the key driver for outsourcing was cost effectiveness and the incapacity of governments to execute all inclusive services. Public-private partnerships have been established, and European tendering procedures have been altered in order to allow for selection frameworks that leave more room for innovation. Now private parties have more opportunities to operate public services on a contract basis, while they carry responsibility for the quality and development of these services at the same time.

A consequence of the fact that the provisioning of eServices is transferred to the private sector is that services are targeted at the average citizen (the European equivalent of John Doe), because personalised services do not reach enough critical mass to be commercially viable. Quality of public services differs because through extra fees citizens can buy faster execution and higher quality of services. Integration between physical and virtual channels is yet to be reached, as the channels are mere complements to each other.

Although partnerships between governments and private parties are in place, different cultures and the limited scope of governments result in relatively closed and independent worlds. Private parties are trying to move government to establish regulations, which facilitate the enforcement of technical standards (a specific aspect of interest thereby is digital identities of users: with technical standards in place it is assumed that citizens may use multiple online identities). However, governments shift action to independent bodies responsible for standardisation, initiated by the needs and efforts of private parties.

Technology

Technology aspects do not dominate society. Each governmental organisation has its own systems, technologies and mechanisms to pass information to other organisations. Standards are developed to integrate and connect systems. Due to the fragmentation, "pollution" of information and information overload are challenges which lead to bad decisions or not providing services to those who have the right to get the service. Some citizens' information is available from anywhere for all government agencies interacting with citizens or businesses. All interactions in each channel are stored and can be used for interacting with other channels.

4.5.2 Individualised society

Table 9: *Main characteristics of scenario "Individualised society"*

Abstract	People have become more individualistic and self-reliant. They want individual choice as a means to maximise their own potential and social security. Interest in politics is low, and government only takes care of essential facilities and services. Because of the stable environment, the private sector is in a position to compensate for the lack of service capacity in the public sector. Technology serves individual needs to manage information and relationships, and to bridge cultures and languages.
Aspects of core dimensions	Environment	Attitude towards government	Government scope
	stable	distrust	core business
Key issues and dimensions	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
	Cosmopolitan	Legal power is fairly distributed	Dealing with information overload
	Europeanisation	Distrust in government	Context-based translation service
	Data protection	Low Participation	
	Clans und cliques play an important role	Outsourcing, Public-Private-Partnerships (e.g. health care)	Networks of contact using P2P exchange mechanism
	Inclusive society	Focus on core business	Monitoring technologies
	Self-responsibility	Flattened hierarchies	Information and knowledge management
	Individual networks		
	Stable environment		Personal broker

Social and contextual environment

The average citizen is a true cosmopolitan. He is not hindered by geographic boundaries,

but picks that environment which best suits his needs at a specific moment in time. As a result, the role of national governments has weakened and European arrangements are favoured, backed by a strong sense of belonging to the European Union. Increased individualisation called for a tolerant society in which decision-making powers are fairly distributed. Privacy protection has made a comeback in a period of relative stability in the world.

People are expected to fill in their own potential and take responsibility for that, which also includes the responsibility for the amount and quality of one's education. In educational programmes, the usage of ICT is central. This created the opportunity for government and private parties to offer eServices to a broad range of the population, as no digital divide is recognisable.

In line with what was expected by forecasters, the individualistic mentality resulted in a sharp decline of the interest and participation in politics. Government has taken technology as the cornerstone of monitoring the behaviour of its citizens, with a focus on the compliance with rules. Technology was believed to be the best alternative in finding a way between the conflicting demands of an increased mobility and anonymity and a need to draw clear lines about what is accepted in the public place. A general feeling of distrust in government's ability to deliver the quality individuals expect from themselves has arisen. However, as it is in nobody's direct interest to try to change this – now that government has withdrawn from many tasks, its impact on daily life is small after all – participation levels are very low.

Governments and their stakeholders

As a way of keeping up with the demands for quality where possible, government has left the execution of many services to private parties, including the biggest economical sector: healthcare. Public-private partnerships are used in a limited number of cases, as government does not want to be involved too much in non-core government services. The core government services (typical state tasks like security) are not perceived as suitable for outsourcing and, hence, are provided by government respectively. Maybe because of this sharp distinction, governmental service provisioning is not very innovative. Most services are targeted at the average citizen, with low synergies between physical and online channels. Single-sign-on and the public key infrastructure set up by many governments a decade ago, have failed because of organisational barriers. The low quality of government services adds up to the gap between government and the public.

Technology

Individuals have found ways to deal with the loads of information they have to process to be successful in today's society. ICT is being used to bridge cultures and languages, by providing context-aware translation services. As each individual is part of different social and business networks, ICT is increasingly being used to maximise the potential value that exists in these networks of contacts by using peer-to-peer exchange mechanisms and technologies for all kinds of information. This helps people in distinguishing relevant information from irrelevant, and in getting a grasp on information quality. As a consequence of the fact that information is power, hierarchies have flattened even more. A second mechanism that increased personal power and efficiency is the rise of personal brokers, i.e. small software tools or organisations that match the demand and supply of information based on personal preferences. These brokers do actively monitor certain information demands and suggest actions. For instance, a broker annually checks whether the current insurance agreement better be moved to another company, and if so, the broker prepares all administrative tasks to accomplish the move.

4.5.3 Ambient government

Table 10: *Main characteristics of scenario "Ambient government"*

Abstract	Government is all around us with high levels of cooperation across boundaries and more emphasis on local government. Social tensions are low and citizens have high confidence in government to effectively and efficiently settle issues for the common good. Technology supports personalised services and high levels of citizen interaction and participation.		
Aspects of core dimensions	Environment	Attitude towards government	Government scope
	Stable	distrust	inclusive
Key issues and dimensions	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
	Europeanisation	Cooperation between Europe's governments	Communication across cultures
	Standardisation	Central EU eProcurement	Universal wireless networks
	Internet communities	Transparent decision-making	Sector-specific regulation
	High investments into education as prevention measurement	Political power at EU and local level raises, decrease at national level	Service-oriented architecture
		No physical contact (high quality of eServices)	ICT as driver e.g. economic growth
		Public-Private Partnerships	Security standards

Social and contextual environment

Over the last years, the European Union has expanded with several Member States, mainly with the aim to increase the size of the internal market. The prosperity brought by the EU is reflected in the high willingness of national governments to cooperate constructively with each other and the EU to speed up standardisation which facilitates trade and entrepreneurship more freely across the continent. Furthermore, ICT is applied to simplify international trade. Cultures within the EU have integrated, not so much because of physical mobility, but merely as a result of people cooperating through the use of ICT and developing a shared understanding. Also, contact with cultures outside the EU is easier, because many people have experience in cross-cultural communication.

Although the ageing society is reality and different income levels exist, neither social nor digital divide occurs. The penetration of ICT in every day life leads to an inclusive society. High investments in empowering people using ICT pays off. The deployment of, and penetration through ICT are only some of the reasons why innovative privacy enhanced technology and means for data protection are widely positioned.

Governments and their stakeholders

A key success factor in the economic performance is ICT. Europe has not managed to build a strong ICT sector on its own. Yet innovative use of ICT for the provision of services and the increase of organisational productivity in all sectors (including the public sector) has given the ICT economy a competitive edge and growth. A famous example is the central EU eProcurement, a procedure which is almost completely automated and which is accessible to all governmental agencies within the EU - up to the level of the smallest municipality. A second innovation, which has had big implications on daily life of citizens, is the replacement of physical money by eMoney. No coins and notes are being used anymore; the European Central Bank

is only issuing virtual money. Micro-payments, whether between customers and merchants or peers, are easily being executed using ubiquitous wireless technology. The pervasiveness of eServices is being stimulated by all levels of government. In most cases, physical contact with a governmental agency is not needed anymore, because all interaction can flow through online systems; the physical channel is only there for really exceptional cases.

Not only the glorious role of ICT is a success factor for government; public administration is also able to meet the expectations of citizens because many social developments have run relatively stable. The world is not as polarised as it was during the turn of the century, and the social tensions between younger and older generations, as well as between low- and high-educated citizens did not grow, because of the economic boost that delivered money to ease the reforms in the social sector and to invest heavily in education. Some immigration has taken place to fill up gaps in the labour force. However, the integration of newcomers in Europe is no sensitive issue, because immigration mostly concerns knowledge workers that do not put a financial burden on the European society.

The role of national government is broad; it is present in all branches of society. Its relative role has weakened, though. All generations feel a certain binding with the European Union, because of its clear advantages for the quality of life.

Elderly are generally more attached to geographic areas than younger people, and their high number made that the role of local government has increased. Municipalities now are primarily responsible for arranging healthcare, because they are much better able to suit the needs of their citizens, and draw up integrated policies, than the national government.

Technology

The deployment of ICT for public value creation leaded to highly intelligent and personalised services, as well as to transparent decision-making processes. Furthermore, ICT promotes participation through online consultation and decision-making systems. And data collection and data mining systems deliver high quality and opinion poll data to politicians for supporting their decision-making.

ICT did not only bring advantages for the execution of governmental services. It was also an answer to the diminishing participation of citizens. Innovative ways of consultation and decision-making, mainly in online communities of interest, have been established. An exemplary case is the governance of the Internet, whose governing board partially consists of a large online forum of Internet users, which are able to directly vote for or against proposed decisions. Hence, decision-making has become very transparent, and people – demanding as they are in all aspects of life – expect government to be open when it comes to its considerations.

Specifically with regard to eServices, the European Union has taken up a leading role in developing new services, together with private partnerships. It also facilitated the market for eServices by establishing security standards, and frequently keeps an eye on the health of the market for these services. Regulation of markets for ICT-infrastructures and services is still based on sector-specific regulations, because its network characteristics did not allow general antitrust laws to take over the role. As a consequence of governmental attention and the establishment of a strong market, the quality of eServices is high.

A main characteristic of modern services is that these are highly intelligent and personalised, so that many administrative tasks have become transparent for the average citizen. The key technology driver to achieve agility in integration and process innovation has been service-oriented architectures, which have become the legacy architecture.

The EU also deploys automated translation technologies to communicate and interact with its citizens.

4.5.4 Government keeps on trying

Table 11: *Main characteristics of scenario "Government keeps on trying"*

Abstract	Despite its efforts to be involved in improving the quality of life on all fronts, trust in government is low. Privacy continues to be a challenge and the organisation of government remains traditional and highly structured. A wide gap exists between a technocratic government and the ability of individuals to take part in it.		
Aspects of core dimensions	Environment	Attitude towards government	Government scope
	stable	distrust	inclusive
Key issues and dimensions	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
	Europeanisation	Governments competing with each other	Automated processes
	Stable environment	Decreasing national power	Networking of ICT-systems
	No digital and social divide	Public-Private Partnerships	
	Data protection	Personalised services	
	Simplification of legal framework	Government focus on inclusive services	
	Multi-nationals get more power	Low participation	

Social and contextual environment

Citizens have become a little more individualistic over the last years, although they still believe that a powerful government with a broad scope is in their interest. They have seen the benefits of further European integration, which has led to internal benefits (more wealth, better education) as well as external ones (the world is less polarised). The social and digital divides have not grown. People are mobile and feel a sense of belonging to Europe, albeit they are willing to move for fiscal or quality-of-life reasons. As a consequence, especially national and regional governments are competing with each other. The geographical competition has weakened the position of national government.

The world is a relatively stable place and there are hardly any disasters and wars. The continuous battle between the proponents and opponents of ensuring privacy has been temporarily won by the former, but this equilibrium can be changed at any time due to unexpected events or new technology innovations. Data protection has become dependent on the circumstances and content. In case of emergency, privacy is immediately sacrificed to response quickly and to preserve order. Economy is strongly dependent on ICT. Technology innovations are one of the main drivers for economic growth.

Governments and their stakeholders

The deployment of ICT within the public sector was did not alter government organisations. Hence people lost their trust in government. But the technocratic government keeps on trying to serve their citizens the best possible way. Means like monitoring and creating a large library of all governmental functions and services help to reorganise public administration. Unfortunately, government is only in the position to provide services at the average level because of too limited capacities.

To offer an inclusive service range, government observed citizen and business needs and bought

individual services on the market. Hence services are designed from the user's point of view.

Europeanisation and therewith free movement of citizens leaded to competition between public agencies and governments. Furthermore, Europeanisation caused a shift of political power from national level to EU and local level whereby services and functions at the EU level are of common nature (e.g. harmonise security, social and tax system) and services and functions at the local level are of special nature provided in respect to the local environment. Besides, Europeanisation leads to full interoperability at organisational, semantic and technical level.

Participation in policy formulation is improved through the implementation and deployment of ICT for direct voting and monitoring in order catch the public opinion.

Technology

Although government becomes technocratic, most citizens cannot profit from eGovernment because technology has not become understandable for non-experts. There is a shortage of ICT skills in society which counteracts the governmental efforts to improve its public value delivery through deploying ICT. Service-oriented architectures are widely used, yet did not lead to a reduced ICT-workforce.

4.5.5 Transition period

Table 12: *Main characteristics of scenario "Transition period"*

Abstract	In a highly polarised world with cultural tensions and intense competition for key resources, governments provide an extensive range of services. Socio-economic policies emphasise individual responsibility, a position widely supported by society. Many traditional public services are provided by the market under strong government regulation. Individuals strongly identify themselves with their local communities, feel alienated from government and use their extensive ICT skills for both personal and political activities.		
Aspects of core dimensions	Environment	Attitude towards government	Government scope
	disruptive	Distrust	inclusive
Key issues and dimensions	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
	Rapid growth of world economy	No user-centric service production	Built-in technology and information infrastructure
	War on resources	Market provides (e)Services	Transparency
	Critical international relationship	Increased partecipation in decision-making	New, innovative participation mechanisms
	Security vs. privacy		Global and local standards
	Mobility and welfare		Open-Source Software becomes less important, robust quality through proprietary software
	Social divide		
	Distrut in government		

Social and contextual environment

The big tensions in today's world are caused by quarrels and fights over resources. With the fast depletion of fossil fuels during the last century, its reserves have declined. At the same time, the world economy has shown a rapid growth, especially in Asia and Latin America, resulting in an energy demand that has never been so high. Also, the first serious political problems in international relations have been expressed around

the supply of fresh water. These fights are sometimes amplified by existing religious tensions between the more Islamic and the more Christian parts of the world. The bad security situation between regional power blocks in the world is mirrored within the European Union, too.

Citizen's main expectation of government is that it ensures security, whereby citizens are even willing to sacrifice privacy for the sake of security. Terrorist attacks are frequent and leave huge scarves on society. The attacks have become more sophisticated and are mainly aimed at disrupting critical infrastructures. To find a sense of safety, people more and more stick to (local) communities, in which they find safety and derive their identity in the rapidly changing world. The increase of the power of communities is also caused by massive immigration streams, the latter being accepted due to a lack of domestic labour force within the European Union.

Governments and their stakeholders

In the EU, mobility and prosperity have grown. However, this has only come at the expense of equality of incomes and opportunities in the European Union. Highly educated people are a big leap ahead on their less educated peers and the working class is politically dominated by the elderly. The internal economy of the EU is quite adaptive. This is partly caused by less interference of governments, which leaves more room for market parties to react quickly on changing issues.

When it comes to the provision of services, government ensures the provision of all-inclusive services. Service provisioning is mainly left to the market under strict control and regulations. Many services formerly thought of as being public to the market are now provided under the supervision of government. Governments are mostly not directly involved in the provision of public services. Public services do not reflect any more a user perspective: Most services are designed for meeting the middleman's needs (who has average ICT-skills). This way, citizens' main interaction with governments in service provision is via an intermediary from the private sector and there is hardly direct interaction between governments and their citizens. Online offers are provided from intermediaries as well. However, for people who do not want to, or are not able to master the use ICT, a physical channel is provided by the private parties under control of governments.

Now that the economy relies for a great extent on ICT, and most (successful) citizens have good ICT skills – independent of their age – the technology and information infrastructure is increasingly being used as a way to increase the participation in decision-making around public affairs. Independent citizens ask for transparency, and use this information to tightly control government when it comes to decisions that are in their own interest. New and innovative participation mechanisms are being used, among which are online opinion exchanges, which are enriched with simulation and gaming capabilities to model and evaluate strategic behaviour of many sorts of actors before implementing new policies.

Only a limited number of citizens are able to steer the government. The ubiquitous possibilities to influence government's decision-making by the average citizen has failed and resulted in low levels of trust and confidence in government. In addition, religious tensions and fierce competition for scarce resources have even further lowered trust in government.

Technology

On the technological side, the increased competition for resources between regional

power blocks has resulted in a fading out of global standards. Different ICT standards come from economic bodies in the US, the European Union and Asia. It is believed that regional standards are a way of protectionism and that the own markets are big enough to reach the critical mass to make technology profitable. More protectionism is also visible when it comes to software. The open source movement has been banned to historical text-books, while they have not been able to deliver robust quality and innovativeness comparable to proprietary software suppliers.

4.5.6 Incident politics

Table 13: Main characteristics of scenario "Incident politics"

Abstract	A two-class society exits due to massive immigration: young, well-educated citizens always on the move and older citizens with a strong attachment to place and only limited understanding of ICT. Society has become largely individualistic, with only a small role for government. The environment is characterised by severe tensions in the world, low trust in government, and a large social divide. Citizens demand security, and government deploys ICT for that purpose. Government also uses ICT to increase efficiency and effectiveness.		
Aspects of core dimensions	Environment	Attitude towards government	Government scope
	disruptive	Distrust	core business
Key issues and dimensions	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
	Social exclusion, digital divide	Problems with providing essential services and eServices	Remote monitoring
	Instable environment (terrorism, religious wars)	Restricted role in legal & governmental issues	Implanted devices
	Europe fails, focus on individual countries	Simplification of procedures and organisational structures	Ubiquitous Digital Right Management
	Privacy subordinated to security	Cooperation and common policy	
	Individualism and self-responsibility	Depersonalised interaction between government and citizens	
	Ageing society	ePartecipation	

Social and contextual environment

Several disruptive developments over the last years have turned different social groups apart. Government has not been able to deal satisfactorily with the challenges imposed by the causal chain that started with an ageing population, a subsequent lack of workforce and finally a massive immigration stream from outside the European Union.

Big changes have not only been visible in Europe, but throughout the world. Inequality and religious intolerance have led to an amplification of religious tensions and terrorism, which is now partially directed towards critical infrastructures. Western power blocks have advocated a further simplification of international trade to strengthen interdependencies and to bring more peace and stability to the world. However, this has not solved problems around non-state bounded terrorist groups or certain (religion-based) forms of tribalism.

Europe failed, and the single Member States refocus on their national objectives in particular with regard to the protection of their own economies. There is a shift from public welfare towards more emphasis on economic growth which resulted also in a shift of powers. Consumers of public services provided by private parties have no chance to protect their data because, in this economically oriented world, profit is more

important than privacy protection. Security is generally valued more important than privacy, too.

Governments and their stakeholders

In the eyes of most citizens, the European Union failed in solving the major social problems. This leaded to a conservative reaction: People nowadays are more focussed on their own nations than was in the past. The economic policy of government has shifted towards a policy, in which individuals get all room they need, and citizens have the responsibility for their own welfare.

A social gap in chances exists between blue- and white-collar workers, and between the elderly and the less prosperous younger generations. When it comes to the use of ICT, the imbalance of generations is high. As the young people have more opportunities to communicate with larger social networks than ever before, they are also much more mobile throughout the EU to get the best jobs wherever these can be found (especially the skilled young people). In several sectors, like healthcare and education, a severe lack of workforce exists, which is a serious obstacle to further economic growth and problems with the provision of essential services, especially for elderly.

The more limited role of government is also visible in its attitude towards the scope of regulation and public administration. Procedures and organisational structures have been drastically simplified, as not to disturb citizens and the forces of the market more than necessary. An advantage of this restructuring of government is that culture at different agencies has converged, so that cooperation and unified policies today are more feasible.

Because of the greater belief in individual power over collective arrangements, people are less interested in politics. This is reinforced by the depersonalisation of governmental interaction with the population. Technocratic means of enforcing compliance are being used, among which remote monitoring and devices are implanted under the skin. With these means, people can be tracked; and extreme behaviour is monitored and recorded.

Though people claimed a necessary balance between State and individual, the opposite movement takes place. Certain public roles are not fulfilled anymore. Collective actions such as contributing to better quality of the environment are not occurring.

eParticipation has been set up, but its value is questionable: small numbers of politically engaged people participate for the sake of participation. However, these citizens are not to be considered a representative mass and do not succeed in exerting real influence.

Government is in the position to withhold people from certain rights on the ICT infrastructures as a way of prevention and punishment. Although technologically very different, the concept resembles the one of digital rights management in the private sector, which is ubiquitously deployed and used now.

eServices provided by government are primarily aimed at efficiency. These services are designed for the average user.

Technology

Technology is aimed at supporting the individual at any place and any time. Ubiquitous networks have been developed. Technology makes eLearning the standard. Programmes of education are customisable by individuals.

Individual electronic identities are fully authenticated, but no privacy protection exists. Each person takes care of protecting his or her own data.

4.5.7 Social state

Table 14: *Main characteristics of scenario "Social state"*

Abstract	Society has changed dramatically because of demographic and security-related developments stemming from immigration, ethnic and religious tensions, and unequal distribution of wealth. Government keeps its focus on the common good and has been able to keep up with high citizen expectations for all inclusive, coordinated services, using state-of-the-art technology with sophisticated security controls.		
Aspects of core dimensions	Environment	Attitude towards government	Government scope
	disruptive	trust	inclusive
Key issues and dimensions	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
	Privacy subordinated to security	High quality and omnipresent service delivery	Technical and legal measures for data collection and data processing
	European Union becomes common economy	Media is still most important power in decision-making	
	Crisis because of unequal resource allocation and welfare	Back warding delivery of public services	Rights management: anonymous & encoded access to automated data
	Job mobility	Investment in participation	
	Increasing social tension	eServices	Technology is transparent and does not disturb human interaction in a negative way
	Huge shared service centres	Networking agencies	
		Unique European identity	

Social and contextual environment

Social tensions have unquestionably grown due to the emergence of a knowledge society, in which chances on success are for a great part determined by education levels. Government has responded with an increase in public spending on education and other social services, so as to distribute chances as fair as possible; however, this has not been able to reverse the trend. The job mobility of people, across all layers of society, has increased; people really feel that the European Union is a uniform economic area. The cultural differences between different countries have lessened, but the tensions between different ethnic and religious groups have widened, both worldwide and in Europe. The reasons are obvious: the large inflow of immigrants to fill up crises in the availability of labour; and the increased global tensions around the unequal spread of resources and wealth.

Governments and their stakeholders

In society, government is highly pervasive in order to guarantee safety, although this only goes at the cost of privacy. However, this has not caused many problems, as the concept of privacy has been better understood. Technological and legal measures account for large scale data collection and mining on the one hand – with a positive effect on national security. On the other hand, this regulates data access and the usage of information in a smart way – by using anonymity and encryption in combination with automated data access rights management.

eServices have become one of the key pillars of government function, both upstream (eliciting participation) as well as downstream (providing public services). Both technological development as well as a full-grown insight into the function of technology in society made that technology is as transparent as possible, so that it does not negatively disturb human interactions and participation. The enforcement of rules still requires human intervention, so

that ambiguity can be accounted for, and state-individual relations have not been reduced to technocracy. Mass media and press are still a major democratic power force, but their role has diminished in favour of more differentiated (online) media channels, which are highly interactive and as such 'construct' the public opinion even on specific matters.

The broad responsibility of government for the common good is reflected in a high-quality and omnipresent service delivery, mainly through electronic channels. The structure of the public administration has been adapted to make it more agile, inspired by the business and Internet environment. Now, the scope of governmental agencies is not so much determined by their legal mandate, but agencies are increasingly working in networks so as to achieve common goals, where each organisation can exploit its core capabilities. In these 'networks for the common good', private parties are included, too. Their role is not only limited to the execution of services, but they can actively participate in the development of new services. This has resulted in a good alignment of policy development with its implementation. A European standard has been established that gives each citizen a unique and secure virtual identity that can also be used in interactions with private parties.

Technology

Government has taken up an active role in helping citizens with formalities imposed by laws and regulations. Many services are being provided semi-automatically, by informing people about their (administrative) duties while at the same time suggesting an answer, so that only consent is needed.

This development is visible in the private sector too: Technology is more and more helping people to selectively use information and assure its quality, taking over (time-consuming) search for information out of the hands of humans. Many eProcesses are being executed by large shared service centres, so that advantageous economies of scale for eServices and ICT infrastructures can be used throughout the European Union. For the purposes of controllability, cost and reliability, large data centres are in use, too.

4.5.8 Empowering state

Table 15: Main characteristics of scenario "Empowering state"

Abstract	In a rapidly changing, confusing world, characterised by continuing economic and age-related tensions as well as ongoing terrorism, citizens rely heavily on basic government services to become more self-reliant. Personal ICT devices help them deal with the complexities of life. Government focuses effectively on its core business. It also persists in its role as care-taker for society but continues to be ineffective.		
Aspects of core dimensions	Environment	Attitude towards government	Government scope
	disruptive	trust	core business
Key issues and dimensions	Social and contextual environment	Governments and their stakeholders	ICT developments in government contexts
	Individual mentality	Less protection of privacy	Security measurements
	Ageing society	Trust in government	Technical standards
	Social divide (education, income)	No interest in decision-making	Unique identity
	Protectionism of economy	No transparency within the decision-making process	Development of technical standards for identity management
	Failure of Europeanisation	Private parties are excluded from the service delivery process	
	Mobility in Europe		
	Intensive international tensions		

Social and contextual environment

In the first decades after the turn of the 21st century, society has changed dramatically. Demographic effects and an individualistic mentality put the society under large pressure. First of all, the numeric overweight of elderly people has been reflected in their power over political issues. They advocate their own interest at the expense of the younger generations.

Active participation and hard working are necessities for everyone not yet being retired, in order to be able to carry the financial burden of pensions and healthcare for the older generations. As the labour force could not only have been fed by domestic growth, large immigration streams from outside the EU have taken place. Also, many people from the Member States that joined the European Union only recently chose for a more prosperous life in older Member States.

A social division is not only visible between generations, but also within the working classes. The gap between blue- and white-collar workers has widened. Education and social positions are key determinants for one's success in society, but class divisions are hard to break. Maybe because of this increased segregation, many people turn around globalisation forces, and reject further liberalisation of the economy. They favour a mild version of protectionism, and stick to their national of regional identity.

The hoped-for development of a European identity is only visible among several of the most successful people, but as such is not wide-spread. This poses conflicting demands on national governments: Although the higher classes wanted further European integration, they are outnumbered by the demands for a more modest approach that primarily focuses on national interests. As a consequence, a movement started with the rejection of the yet another version of the European Constitution. An element extensively worked out is the strengthening of the power of the regions, especially important in countries that traditionally do not have a very homogeneous culture.

In general, people are eager to move around Europe if – in the case of lower-educated people – this increases their chances for work and jobs. For the elite, mobility is not only a way of making money and getting the best out of their careers, but also a symbol of status.

The sharpening of distinctions is also visible beyond Europe. It leaded to more intense international tensions. Inspired by religion, poorer countries of the world continue terrorism against the West. The era of 'conventional' terrorism has been replaced by more subtle forms reaching high impact and carrying heavily dangerous consequences. The organisation of crime, and in many cases the battlefield itself, have shifted to cyberspace. For example, denial of service attacks and intrusions have put the availability and reliability of essential ICT services under pressure. The threat of terrorism has shifted the balance between security measures and privacy protection dramatically. Government's intrusion in gathering information is all around and generally accepted.

Governments and their stakeholders

The accumulation of rapid changes in society has put demands on government that have not been fulfilled. The strong belief people still had in the pervasive role of government in society, and its responsibility to act in the interest of the general public by advocating the common good in all areas thinkable, contributed to these unrealistic demands. As a result of the inability of government to deliver what it is asked for, a deep feeling of distrust amongst the population exists. This fundamental problem has provided a breeding ground for many new political parties and interest groups recently. Yet they failed too,

leaving the public with frustration about government's capabilities to deal with social issues. Therefore, people are not willing to participate in public decision-making any more. As a result of this disinterest, government does not face tough control by the media or the general public, leading to non-transparent decision-making by old-fashioned bureaucrats.

Somewhat surprising, the government still has high ambitions to solve societal problems. This is a reaction on the more individualistic society and a previously held strong belief in the market. It has become clear that the interaction of private parties alone can result in socially disadvantageous situations, which can only be resolved by governmental intervention. Government includes private parties in the delivery of electronic services and is able to focus on their core business. The government has set the right conditions and the quality of eServices is quite high. Government did recognise the increased heterogeneity of its citizens and adapted the services so that they are easily customisable and highly personalised.

To reduce operating costs, a necessity now that skilled labour is so scarce, is that the virtual channel can almost function as a complete substitute for its physical counterpart. To speed up the development of new services and enhance trust, government decided to develop a technical standard for identity management, backed by a solid legal framework.

Technology

All people carry a personal device for identification, information processing, visualisation of information, and payment. Technologies have converted and the devices have intelligence to continue adjust to the ever-changing preferences of the user and to the environment. Therefore, all services can be customised and are location-based. The devices manage identity, profiling and information exchange with governments and companies. Over time, these devices are also able to expand a citizen's personal profile and preferences. The devices are used to observe / monitor people, when an accident happens all information of all people involved become automatically available to the first responders.

4.6 Reflection and discussion

Several scenario studies are available about the future of eGovernment (cf. state of play in chapter 3). In eGovRTD202, we went beyond these scenario studies in several ways:
- a longer term vision was taken;
- regional differences were captured, and
- a variety of heterogeneous views were obtained by consulting a large number of experts from government, ICT industry, consultancy, and academia.

This is emphasised by our research findings, as an overwhelming number of 159 dimensions impacting the future were found.

In general, in all scenarios new, disruptive technology is not considered as a key element affecting the future of eGovernment in 2020. Instead, innovations are expected from bridging the gap between technology and context, i.e. by improving and applying current technology in such a way that these technologies can be deployed to solve a societal or governmental problem. One explanation for this might be that disruptive technology

cannot be predicted. Another explanation is that a lot of technology is available and waiting to be deployed on a large scale and only affecting society after being in place. The participants often implicitly assumed that changes and implications are not intrinsic characteristics of the technology, instead of being dependent on the context, implementation and adoption by society.

Most of the participants expected that future eGovernment challenges would come from the changes in the society and in the interaction of government with their environment which are more likely to determine the methods of monitoring, interaction, collaboration, policy making and enforcement. As such, the participants expected that societal and modernisation of government aspects will primarily influence the different futures. Despite the involvement of many technologists, in most cases technology was viewed as an instrument to help solving societal problems.

The general view is that society in 2020 will be different from now and that the current struggle with the translation of these technologies into government applications will be solved. Thinking in terms of cooperation in communities, solving the privacy problems and ensuring safety and the local focus to stay close to citizens seems to be the vision of most of the session participants. Sensing, information exchange and processing, and connectivity at a semantic level with other governments, but also with private parties, are key to the effective functioning of government. It is expected that breakthroughs in eGovernment will not occur because of a specific application or disruptive technology, but primarily due to the deploying of technology when governments interact with their constituencies.

It has already been stated that the future cannot be predicted. The scenarios developed here approach a number of alternative futures. In this chapter the alternative futures are captured in a cubicle consisting of three key dimensions. The environmental dimension indicates that the future can either be stable or disruptive. A stable environment can be characterised by economic growth, a balanced world order, living in harmony. In a disruptive environment all kinds of crises and incidents occur. The second dimension indicates that constituents can have a positive attitude towards government and have faith in the government or might have limited trust in government. The third dimension shows that governments can either focus on their core business leaving as much as possible to the private sector, or government might be all encompassing.

In order to develop a robust policy-relevant research agenda, it is important to consider the implications of the full range of future possibilities encapsulated by the divergent dimensions, and synthesised into a set of final eight scenarios. Independent of the position of the real and desired future in the cubicle there is a gap of current eGovernment advancements in research and development (depicted in the state of play) in respect to meeting the needs and challenges of potential futures as described in this chapter. The next chapter reports the gaps identified, and it provides a discussion of the peculiarities of these gaps.

5. Gap analysis: the process and gap storylines

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5.1 Introduction and facts of gap analysis results

The overall aim of gap analysis was to identify mismatches of current research (cf. state of play in chapter 3) and future needs of developments based on the visionary scenarios (cf. chapter 4). The rationale for the analysis was to identify indicators for future research themes (i.e. gaps in current research or needs for future research), and to convey the needs for future research to the roadmapping phase in an effective way.

The basic input for gap assessment were the 149 dimensions and topics of interest extracted from future scenarios (Deliverable D 2.1, 2006), which were classified in eleven categories as introduced in section 2.3. Table 16 presents an overall picture of the dimensions and topics of interest clustered into the twelve categories.

Table 16: *Summary of dimensions, topics of interest, and gaps identified per category, including the number of gaps ranked as very high*

No.	Categories	No. of dimensions & topics of interest	No. of gaps identified in step 1	No. of gaps identified in step 2	No. of very highly ranked gaps
1.	Society	17	10	3	2
2.	ICT	10	7	2	2
3.	Government	13	7	5	4
4.	Economics	0	0	0	0
5.	Society & ICT	3	6	4	2
6.	Government & ICT	3	0	0	0
7.	Governments & Society	20	6	5	0
8.	Society & Economics	3	1	0	4
9.	Government & Economics & ICT	3	0	0	0
10.	Government & Society & ICT	14	8	5	5
11.	Governments & Society & Economics	9	7	0	1
12.	Government & Society & ICT & Economics	32	16	8	7
	TOTAL	149	77	32	20

In the gap analysis phase, altogether 109 gaps were identified. Each gap was assessed by the project partners using the eGovernance model described in section 2.7.2. Twenty gaps were assessed as very highly relevant and important towards the eGovernance model. Gaps were also assessed by the experts participating in the first iterations of the roadmapping workshops (see section 2.8 for the methodology, chapter 6 for the results, and Deliverable D 4.1 (2006)). So it is worth stressing that, while the project partners formalised and conceptually organised gaps and gaps storylines, these were basically

the result of a truly bottom-up approach thus conveying the views of more than hundred experts from across Europe and USA.

Twenty gap storylines have been collected in the gap analysis. The gap storylines describe a coherent collection of deficiencies or absence of dimensions and topics of interest in current research. They are reported in section 5.3 via a gap storyline brief, an abstract, the gaps from the D 3.1 report (Deliverable D 3.1, 2006) embodied in the gap storyline, a storyline towards ideal futures and potential solutions, and an argumentation of the assessment of gaps. The storylines are intended to argue future eGovernment research based on the needs highlighted in the scenarios, and risks and weaknesses identified in current research. Consequently, they convey potential needs of research, which are taken up further on in the roadmapping results.

Before presenting each gap storyline, the next section introduces the application of the gap analysis methodology described in section 2.7. An example of a research gap identified in step 1 of the gap analysis methodology (current research does not meet the requirements of the future) is introduced in section 5.2.1 (including the gap assessment – step 3). Section 5.2.2 exemplifies the step 2 – current research does not address the future need – including the gap assessment (step 3). In section 5.2.3 an example of a full gap storyline description as reported in Deliverable D 3.1 (2006) is provided – conferring to step 4 of the gap analysis methodology. Each gap storyline describes the key aspects of the gaps clustered into the storyline, including key research needs and potential solutions.

The storylines provided in this chapter (cf. section 5.3) are based on the assessment of gaps by the consortium members as well as by participants in the roadmapping workshops.[24]

5.2 Example of gap analysis

5.2.1 Example of a research gap resulting from weaknesses of current research (steps 1 and 3)

In the gap analysis phase, a number of gaps have been described and assessed according to the gap analysis methodology. To investigate the gaps in current research, issues of future scenarios were compared to issues in current research. These issues comprised the dimensions and topics of interest, which were analysed, compared and assessed.

Table 17 documents an example of research gap description (identification of commonalities observed in the state of play) and research gap assessment according to the relevance and importance towards the eGovernance model.

5.2.2 Example of research gap identified as lacking in current research (steps 2 and 3)

Table 18 shows an example of a research gap, which identified a research theme that is not yet researched well, i.e. no or marginal current research is performed.

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24. It is to be noted that the storylines reported in section 5.3 reflect a revised and improved description in respect to the D 3.1 report available online at http://www.egovrtd2020.org/. This is due to the fact that the roadmapping workshop consultation resulted in updates and refinements of the gap storylines, which are documented only in this book.

Table 17: *Gap "Ontology and Semantic web"*

Issues compared from the state of play and the future scenarios			
Scenarios		**State of Play**	
Dimension	*Topics of Interest*	*Dimension*	*Topics of Interest*
Ontology and Semantic web	ICT as mediator (not only for syntax and semantic interopera-bility but also to bridge cultures)	eGovernment as a research discipline of its own	Trans-disciplinary approaches aiming at reducing the gap between humanist and technologist perspective in: intelligent agents, semantic web, broadband communication, ubiquitous computing
	Semantic web technologies		
	Ontology		
	Translation technologies		
	Multilingual problems in central eGovernment services		
Commonality			
Currently, the European Commission supports several research projects in the 6th FP focusing on providing semantic interoperability among eGovernment services across organisational, regional and linguistic borders. In spite of the fact that there are some projects dealing with ontology and semantic web already in place, there are still many issues to be addressed in further research.			
Gap			
Common European eGovernment ontology and an agreed European eGovernment glossary are not established. Common specifications for semantic interoperability are claimed as being needed, for instance through a regulatory eGovernment service terminology and service information model. In regard to globalisation, a need for, and likely a successful development of automatic translation machines will progress, which will help to bridge the gap between people speaking different languages. To assure this, more research is needed in this field. Trans-disciplinary approaches aimed at reducing the gap between the humanist and technologist perspectives in intelligent agents, semantic web, ontologies, broadband communication, and ubiquitous computing, are needed.			
Gap Assessment: Very High Relevance			
Common European eGovernment ontology and agreed European eGovernment glossary are essential for eGovernment service provision at the European level. Hence, this field is very highly relevant to policy making, policy execution and policy enforcement in 2020. In particular, this is instrumental in reaching strategic objective one of the EU i2010 Information Society Strategy, namely "A single European Information Space" (see chapter 8 for details).			

Table 18: *Gap "Remote monitoring"*

Scenarios		Related Topics of Interest from the State of Play
Dimension	Topics of Interest	
Remote monitoring	Remote monitoring of Health	Monitoring of the children's health, and education
	Big brother issue	
	Built-in devices for monitoring	
	Monitoring for data collection and decision making	
	Monitoring everything and enforcement	
	Monitoring of people	
Gap		
A great research potential exists for improving monitoring of law enforcement and surveillance in crime prevention. Remote monitoring of people for healthcare bears another potential for advanced ICT usage. Built-in devices will help to collect data for decision-making and monitoring in all needed fields. This gap can generate a "big brother" issue, which people may be afraid of. However, many persons are willing to give up some privacy in order to get and use data, information and eServices they need. How all these issues relate to one another needs to be investigated properly.		
Gap Assessment: High Relevance		
Modern ICT and built-in devices open a lot of opportunities for data gathering, its use and provision also in the eGovernment field. More research is needed to identify and apply possible solutions in this field in the future. Also standardisation issues and privacy concerns need to be addressed.		

5.2.3 The storylines for the gaps of very high importance/relevance to the eGovernance model – Step 4

The gap storylines have been described in a template comprising of: a brief gap description, the storyline describing the future potential, risks, and needs of research, and links to the gaps and scenarios embodied in the gap storyline.

An example of a gap storyline as described in the original report is documented for the gap storyline: Using ICT to redesign government structures and processes:

Gap description: One major challenge of eGovernment is that organisational structures and functions have not kept pace with changes in technology. However, governments and other public institutions have limited incentives or no motivation to change and redesign their work processes (unlike the private sector). Research is needed to design or (re-)engineer approaches to public administration that more fully benefit from the opportunities provided by eGovernment. This effort should be guided by change management, performance management and monitoring of progress aimed at measuring the effectiveness of (re-) engineering approaches and assessing the state of modernisation. There is also a lack of the research on measuring the influence of digitisation on the effectiveness and efficiency of governments (electronic public services quality measurement).

Gap storyline: Future scenarios describe a completely reorganised and restructured public administration enabled by ICT-development. However, there is a gap between current practices, cultures and operations and the reengineering efforts needed to transform public administration. The current norms and values of public sector employees are focused on risk avoidance and enforcing current structures, instead of concentrating on innovation, entrepreneurship and reforming public administration. Effective eGovernment requires the transformation of the public administration to ensure, for example, that

- Central procurement is arranged;
- An integrated, one-stop service strategy is created;
- Cross-organisational processes function effectively;
- Citizens and business are involved in participation; etc.

This might also require the design of new governance structures.

A common misconception is that the biggest challenges facing the implementation of new technologies are technical. Rather, both research and experience show that public IT managers spend considerable energy in dealing with non-technical issues; technology challenges typically pale in comparison with the transformation of public sector structures, gaining of stakeholder commitment, understanding of business processes and technology, and negotiation about assignment of investments and costs. There is still not enough emphasis on the organisational design, on business process design, and on socio-technical systems development. Instruments to evaluate the effects of technology, to identify new opportunities for modernisation, and to assess the impact of these changes on the future of eGovernment are needed.

Gap scenario issues cover:

- The need for (re-)engineering methods for breaking through the traditional boundaries between organisational units to demonstrate the value of cooperation at a national and European level.
- Discussions of modernisation often result in speculations about what should be done, instead of actions. There is a need for more insight into (1) possible actions that can be taken and (2) the implications of actions and careful analyses of modernisation plans.
- Culture-based conflicts and collaboration issues may impede implementation and block innovation. More research is necessary on how to bridge these cultural barriers.

Gaps from other categories clustered in this gap storyline:
- Innovative and new services
- Reforms in administration
- Automating of the back-office
- Public values.

5.3 Gap Storylines

The subsequent sections 5.3.1 - 5.3.20 present a revised elaboration of the gap storylines developed from the gaps identified along the gap analysis phase (steps 1, 2 and 3), which were assessed as highly important/relevant to the eGovernance model. Some storylines cluster also gaps, which were not ranked as very high important/relevant. However, due to their relations to the gap storyline developed, they were also mentioned. Hence, a more comprehensive picture of gaps is reflected in the gap storylines reported below. The gap storylines are described in terms of:
- A gap storyline brief;
- An abstract of the gap storyline;
- The gaps clustered in the gap storyline;
- A storyline towards an ideal or unwanted visionary image of the future, including potential solutions; and
- An argumentation why the gaps were assessed as highly important in respect to the eGovernance model.

The gap storylines are clustered along the eleven categories described in section 2.3. The full report of gap analysis, and a more detailed description of gaps extracted is available online as deliverable D 3.1 (2006). An overview of the gaps covered in the subsequent 20 gap storylines is provided in Table 19.

5.3.1 Networked governments

Gap storyline brief: Lack of readiness of governments to network among each other and to collaborate efficiently in physical and virtual space.

Abstract: In an ever faster evolving society, governments have to become more flexible and be able to adapt their portfolio of public services to user needs while keeping pace with the tremendous technological advancements. Public services need to become more effective and more efficient. Networks among governments at the same level and across different government layers become a critical instrument to master the large amount of duties and responsibilities entailed in servicing and regulating society and the market. Some issues are not well understood in this context: How can governments network more efficiently among themselves to synchronise and jointly use their resources (equipment, competencies, resources, etc.) in order to meet the expectations of their constituencies and to create public value? What policies, organisational, technical as well as cultural changes are needed to network more effectively between governments (in traditional mode and virtually)? What would be the impact and benefit of ideally networked governments? Current research is not addressing the challenges of large networked governments in terms of responsibilities, reorganisation of hierarchical structures and change in the distribution of power. Likewise, the role of ICT to effectively support and enable fully networked governments is not sufficiently addressed in this respect is not sufficiently touched in current socio-technical research.

Table 19: *Overview of gaps covered by the twenty gap storylines*

Categ.	Gap storyline	Gaps incorporated in gap storyline
Government	1. Networked governments	(1) Government networks
		(2) Government communities
	2. Legal frameworks	(1) Standardisation of laws, regulations and taxes
		(2) Rationalise the legal framework for eGovernment
	3. Changing power structures and new government roles in the virtual world	(1) Competition among governments, regions and nations
		(2) Competition among nations
		(3) Competition among regions
		(4) Distribution of decision-making power to local government.
		(5) Globalisation
		(6) Power of the EU in the world
		(7) new types of virtual borders
		(8) Fragmented politics
		(9) Integrated vs. fragmented public administration
		(10) Hierarchies will flatten
		(11) Increasing power of multinationals
Government & ICT	4. ICT innovation in governments and ubiquitous government systems	(1) Ubiquitous systems
		(2) Voice control (UI)
		(3) Small, ubiquitous, wireless technology
		(4) Network of sensors
	5. Towards pan-European standards & Interoperability	(1) Interoperability standards
		(2) Central EU eProcurement
		(3) Interoperability among cultures
		(4) Interoperability among government systems in society
		(5) Peer-to-peer
		(6) Service-oriented architectures
	6. Value of ICT-investments and ICT-dependency	(1) Governance in service provision & Role of government in service provision
		(2) New types of governance
		(3) New types of IT-governance
Government & Economics	7. Goal-oriented, value-added public service provision at all levels of governments	(1) Centralisation of service provision at national level vs. competition in regions
		(2) Centralised / decentralised storage
		(3) Reform of public administration
		(4) Using ICT to redesign government structures and processes
		(5) Local governments arrange healthcare

Government & Society	8. Free movement of citizens and companies	(1) EU-expansion
		(2) Europeanisation
		(3) Geographic borders disappear
		(4) Competition among governments, regions and nations
	9. Government's (re)action to challenges linked to large socio-demographic changes	(1) Problems with social security and pensions
		(2) Cultural convergence and slow down
		(3) Old people rule
		(4) Immigration
		(5) Ageing
		(6) Religious wars and conflicts
Government & Society & ICT	10. New technologies for automatic monitoring and surveillance to provide security	(1) Automated monitoring and enforcement
		(2) Embedded chips
		(3) Implanted technology devices
		(4) Remote monitoring
		(5) Limited freedom
	11. Advanced technology in crime prevention and crisis management	(1) Crisis management
		(2) Cyber wars and crimes
		(3) Incident politics
	12. Securing transparency, trust and data privacy	(1) Data access and regulations
		(2) Digital rights
		(3) Information access and transparency
		(4) Intellectual property
		(5) Information ownerships
		(6) Transparency
		(7) Privacy
		(8) Privacy and security
		(9) Legitimacy and trusted State and politics in decision-making
	13. Access for all in an inclusive society	(1) Level of inclusions
		(2) Broadband
		(3) Digital divide
		(4) Social divide
	14. eParticipation	(1) Virtual borders and citizenship
		(2) Communities of internets politics
		(3) Community Society
		(4) eParticipation
		(5) Simulation & Gaming
		(6) High media impact of participation

Government & Society & Economics	15. Identity management	(1) Identity management
		(2) Use of Biometrics
		(3) One European-wide identification and authentication
		(4) Worldwide identification and authentication
	16. Public-private-civic relationships in public service provisioning	(1) Lean government
		(2) Outsourcing of public services
		(3) Services provided by private parties
		(4) Health is privatised
	17. Changing Public values	(1) Changing public values
Government & Society & ICT & Economics	18. Full online availability of public services	(1) 24x7 everything
		(2) Integration of various modes
		(3) Multi-channels
		(4) Open universal access
		(5) Government is fully present and seamless, but operating at the backstage
	19. Information availability and retrieval and Knowledge Management	(1) Information and knowledge management
		(2) Decision making technology
		(3) Multi-agent systems
	20. Information quality	(1) Information quality

Two *gaps* are *covered* in this storyline: (1) *Government networks* are a trend emerging in the future scenarios. Consequently, a strong dependence on ICT arises, and the government hierarchy will change. How such government networks should be organised and should operate best is unclear. Frameworks to establish effective government networks do not exist. The roles and activities of interest groups in government networks are not investigated, and the impact thereof on government activities is unclear. Whether government will be centralised or decentralised in future remains an open issue, too. (2) *Government communities* may be important liaisons of future effective government structures. Yet, how these operate and what the real benefits of such communities among governments would be needs to be investigated carefully. Lack of appropriate policies, frameworks and impact assessment indicators can be encountered.

Storyline towards ideal futures and potential solutions: In several scenarios[25], governments are fully networked and provide mainly online services through e.g. one-stop shops. In order to provide such a networked government structure, strategic policies of collaboration as well as proper infrastructures need to be in place. Above all, legal compliance and compliance to different constitutions of States need to be secured. Proper public-public and public-private-civic sector collaboration models could help to transform to effective collaborations and to measure the benefits of such collaboration. Impact and value assessments would accompany such government networks and these indicators could drive collaboration. Hands-on guidelines would support in the establishment

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25. The scenarios are: "Orchestrating government", "Individualised society", "Ambient government", "Government keeps on trying" and "Social state" – see section 4.5.

of collaboration among public (and private / civic) organisations thereby guiding in the reflection of distinct aspects such as: rationale for collaboration, legal conditions, trust models, transparency, business model of collaboration, reference procedures of cross-organisational collaborative processes, operational cultures to enable and favour collaboration, technical means (security, access rights, identification, standards to guarantee interoperation, workflows and ad-hoc agreements, etc.) to enable collaboration, benefits and cost savings of such networks, and so on.

Assessment of gaps and gap storyline: The gaps of this storyline were assessed as high due to many unresolved issues concerning the strategies to establish government networks and the integration / interoperation of public information systems. Government networks were considered as bearing a high potential for efficiently mastering the challenges of the public sector in an ever faster changing environment with new expectations of the constituencies, and ever shorter budgets. If government networks will not grow, a high risk exists that government may not be able to fulfil their responsibilities and duties effectively in the future, which may have a tremendous impact on stability and wealth of society and the market.

5.3.2 Legal frameworks

Gap storyline brief: The peculiarities of legal barriers in eGovernment modernisation are not understood well, hindering advancements of ICT innovation. A lack of uniform systems of laws, regulations and taxes across the EU Member States, and the need for more unified legal frameworks facilitating eGovernment among Member States were identified.

Abstract: Often, legal frameworks are not aligned with the new possibilities enabled by ICT investments or create barriers to effectively exploit technical opportunities. The impact of rigid regulations on hindering innovation is not understood well. Likewise, it is not well understood how much modernisation and ICT innovation can be spurred or facilitated through the reform of regulations. If Europe keeps growing in terms of number of Member States, the potential benefits, impact and problems of harmonising and standardising legal frameworks, market regulations, healthcare, education, taxation systems and other domains of common interest have to be understood better. Likewise, the dependency and interoperability of laws and regulations in such domains has to be investigated well in order to pave the way for pan-European legal standards. Current national political and social traditions as well as administrative structures of the each Member State interfere with European common interests. It is important to understand well, in which areas European regulations can be implemented, and in which areas responsibility should still remain at the Member State governments without hindering the EU overall strategic goals of free movement of citizens and companies, and a common economic market.

Two gaps are covered in this storyline: (1) *Standardisation of laws, regulations and taxes* express a lack of understanding the global benefits and the impact of standardising and harmonising laws, regulations and taxes at the EU level, whilst having to cope with an opposing strength (and challenge) of the EU: the diversity of the Member States. It is possible that in the future an increasing number of domains of government activities will consist of two parts: one part common for all EU Member States and the other part specific to each Member State. (2) *Rationalise the legal framework for eGovernment* raises the question of how to assess to what extent regulatory frameworks concerning eGovernment should be national and to what extent they should be common for all EU Member States.

Storyline towards ideal futures and potential solutions: In two scenarios[26], the EU might create more uniform systems of laws, regulations and taxes. The scenarios imply a more unified EU eGovernment legal framework among Member States. Research is needed to understand to what extent the existing differences concerning national laws, regulations and taxes are an obstacle for development of pan-European eGovernment. An important question for research is investigating where harmonisation at European level will prove a benefit and added value for economic growth and knowledge society across Europe, and where it just limits diversity, which is usually a source of creativity. In a visionary ideal eGovernment world, a good balance among European regulations for common interest and national laws respecting national traditions of the countries exist, which are interoperable across countries and further economic growth and free movement of citizens and companies among the Member States. To figure out the right trade-off among European legal frameworks and national laws, a measurement framework exists which helps to decide whether a harmonisation of laws and regulations at a pan-European scale creates more benefits than national laws which respond to cultural and political differences of the EU Member States. Such a measurement and impact assessment framework respects requirements of pan-European eServices, user interfaces of eGovernment applications, identity management, interoperability of systems, knowledge and capabilities of national governments to apply EU laws, etc. and it provides guidelines for proper transition if a new Member State has to shift to EU laws and regulations.

Assessment of gaps and gap storyline: The gaps of this storyline were assessed between middle and high. The problems concerning eGovernment legal frameworks are partly solved in Member States individually as well as on the EU level. However, it is still unclear which laws, regulations and taxes in general as well as related to eGovernment could be harmonised on the EU level, and which ones need to remain under the responsibility of national governments due to their peculiarities.

5.3.3 Changing power structures and new government roles in the virtual world

Gap storyline brief: Awareness and visions of the options, consequences, economics and impact of vertical and/or horizontal power shifts - from certain government layers to others (e.g. from national to European) or to other sectors (private, civic) –, and of changing government borders are missing. Likewise, the role of ICT in such changing power structures is unclear.

Abstract: The consequences and impacts, which a change in the government (federal) systems across Europe will have in terms of public value perception, political power and competition among regions and different government systems, are not well understood. What would be the drivers for competition? How to identify and develop a good transition mechanism? What would be the role of eGovernment in such a scenario? And what would that mean to society and ICT deployment?

Eleven gaps are covered in this storyline, which can be summarised and classified as follows: (1, 2, 3) *Competition among governments, regions, nations & Competition among nations, and regions*. Since people choose to move their addresses more frequently, the government's competition for citizens is intense. Those countries and regions being the most attractive will be the most prosperous and wanted, whereas those which are not able to attract a population will decline. This gap is related to the problem identifying how ICT can help a government improve its attractiveness to citizens and organisations at the

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26. The two scenarios are: "Ambient government", and "Government keeps on trying" – see section 4.5.

region level. It is associated with a lack of knowledge concerning the role of eGovernment policy and eGovernment services quality in the decision of a citizen to select a region for his or her residence or a company for direct investment. (4) *Distribution of decision-making power to local government*. The impact of distributing the decision-making power and eGovernment infrastructures at local government concerning the specific administrative structures of a country towards the economy, governments and society is not clearly understood. Meanwhile, monitoring and the creation of transparency by the deployment of ICT for preventing misuse of power might be an interesting research topic. Balancing the power between government and private sector through ICT systems should be further investigated. *(5) Globalisation, and (6) Power of the EU in the world* refer to the power and impact of a large and strong EU in world politics. The role eGovernment plays thereby needs to be carefully investigated. With the globalisation and virtualisation, *(7) new types of virtual borders* may arise. Clarification of the interdependencies and trade-offs among globalisation on the one hand, and virtual borders or fragmented policies on the other hand have to be investigated. What types of virtual borders may appear? What is the role of governments in influencing or even regulating such virtual communities and the borders they may impose on outsiders? Issues of global public goods transcending virtual borders when being traded may have to be sorted out by governments. What is the role of governments in regulating and intervening in virtual and real worlds in the future? What role does eGovernment play thereby? Will future government's role shift to regulating virtual world conflicts? Another alternative consequence of shifting powers is (8) *Fragmented politics.* In the same direction, (9) *Integrated vs. fragmented public administration* is to be mentioned. Both issues carry two distinct extremes of the dimension of politics and power structures. The importance of coalitions among sovereign bodies seems to grow at the moment, though government modernisation using ICT should reduce the importance of parties/ coalitions at all. Many different business models are feasible in one or the other direction. However, it is unclear which model fits best under what circumstances, and what the consequences of either model are for the current structures. With a fast political, societal and technology evolution as predicted in the scenarios, (10) *Hierarchies will flatten* as a consequence of the EU level and local levels of governments becoming more powerful. Another aspect linked to the changing power structures in governments is the (11) *Increasing power of multinationals.* In a fast advancing technology and society evolution, the ICT industry may become a strong power holder, if governments do not succeed in sorting out good, strong and balanced service offers.

Storyline towards ideal futures and potential solutions: Several future scenarios[27] envision that people, goods and money can seamlessly pass borders. In several scenarios it is expected that new types of borders will come into existence, so-called virtual borders. The role of ICT is even more important in improving the attractiveness of cities, regions, and States to citizens and businesses. Due to the further expansion of the EU the challenges of diverse cultures, national laws and changes in public administration structures have to be faced, which require common organisational and technical standards, and harmonised legal norms (see also section 5.3.2). Future scenarios envision governments which are transparent, accountable, and capable of adapting to change. Governments should be able to offer high quality, anytime, anywhere services in order to be competitive in the global environment. Europeanisation and globalisation imply that Europe and

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27. The scenarios are: "Orchestrating government", "Individualised society", "Ambient government", and "Government keeps on trying" – see section 4.5.

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even world citizens continue to become more mobile and Europeanisation increases (see also section 5.3.4). Such visionary images raise several complex challenges to eGovernment research. A conceptual framework should be developed to help balancing issues about competition among governments / regions / and needed collaboration among them as well as with private and civic sectors to offer seamless cross-border services. Proper governance structures need to be developed, and the consequences and impact to government, society and market need to be studied carefully. Further research effort is needed to understand the impact of distributing the decision-making power at local government concerning the specific administrative structures of a country towards the economy, governments and society. New experiments are as well needed for better understanding the implementation and outcome of new cross-border collaboration enabled by innovative and networked ICT. Changing power structures is a long time journey, and it must be researched from different angles at the same time: impact of change, framework to guide the change, effective means to achieve change and risk assessment of such power change etc.

Assessment of gaps: The gaps of this storyline were assessed as high due to many unresolved issues concerning the strategic importance for better understanding the underlying principle for changing existing power structures and governments' role in the virtual world. Many environmental changes require the EU to better understand whether the current power structures will change due to societal, political and economic evolutions. If the answer is yes, much research effort must be put on better understanding the way governments in Europe should change and the direction to secure economic competitiveness in the world. A high risk exists that governments may not be able to realise the necessity for such a change and may not have the capability to change, so multinationals from the private sector may take over the power to govern.

5.3.4 ICT innovation in governments and ubiquitous government systems

Gap storyline brief: Especially mobile technology and convergence of technologies are upcoming technologies with high potential for eGovernment. Understanding the potentials and pitfalls of fully networked and ubiquitous systems and technologies is missing. Which technologies do have a potential for public sector applications, and what could be the benefits and impact of extensive ICT usage and ICT dependency?

Abstract: Application and integration of new technologies and devices will more and more result in ubiquitous systems. How can the public sector with its peculiarities and constraints deploy new technologies more quickly and successfully to be more innovative, and what innovative technology developments are needed to advance from within, and serve certain public sector areas? The pros and cons of fully integrating and exploiting modern ICT applications in public sector applications are not well understood. There is a lack of investigating and identifying opportunities for merging different ICTs for government modernisation purposes, and for spurring ICT innovation from within governments. Furthermore, studies about the large-scale deployment of embedded chips and subsequent innovative public sector modernisation in surveillance, monitoring and prevention of crime have to be carried out. Crucial non-technical barriers for the wide application of embedded chips in policy enforcement and policy execution are missing.

Four gaps are covered in this storyline: In the future, (1) *Ubiquitous systems* could be the base for a no-stop-government continuously accessible for a massive number of users thereby using (2) *Voice control (UI)*, (3) *Small, ubiquitous, wireless technology* and a (4) *Network of sensors*. These technology challenges are currently not well understood

in their application in the public sector. In general it can be said that basic technology innovations need first to be piloted and tested for their suitability and applicability in public sector areas. A general lack of applied research is encountered, where trials and applicability as well as consequences and impacts of such advanced technologies on government activity are measured and studied. Often, technical findings require further research in their application and deployment. Such type of research is generally lacking in the public sector. As a consequence, innovation in the public sector is very low.

Storyline towards ideal futures and potential solutions: Future expectations go beyond the one-stop-shop approach, calling for a no-stop-shop[28]. Country-wide penetration of ICT and interconnection of information systems is the basis for ubiquitous information systems. Current research focuses on the different aspects of ICT systems instead of balancing multi-channel access, interoperability and convergence of distinct technologies and devices. Extensive conceptual modelling becomes a key success criterion to manage the large complexity of such ubiquitous information systems. As there are many isolated applications, concepts of embedded systems in eGovernment settings call for research on the opportunities and benefits of converging ICT in public sector applications, including convergence of technologies of various modes. New ways of communication and interaction between various ICT applications and devices are expected in the future, e.g. voice recognition and control instead of input via keyboards. Successful implementation of ICT implies user friendly service provision and eInclusion. By encouraging applied research and diffusing new technology findings in the public sector, the government sector spurs innovation and is able to cope more easily with technology and organisational innovation imposed by society and the economy. In some scenarios of the regional workshops[29], the development and deployment of embedded chips (in devices or as implants) is expected as standard in future eGovernment. In particular, the deployment of these chips for identification, authentication, and monitoring is expected. Embedded chips shall be applied not only for crime prevention but also for service delivery. Another aspect needs to be further investigated: Some scenarios envisage the use of implanted chips. In the opinion of most participants of the regional scenario-building workshops, this is an unwanted scenario. However in that case, research is needed to investigate well-grounded arguments to hinder the deployment of such chips, e.g. legislation, social factors, side effects to the human body, etc. Besides, alternatives to avoid such negative evolutions of technology deployment need to be found, e.g. other enhanced ways of identification and authentification.

Assessment of gaps: Ubiquitous systems will provide ubiquitous access to eServices and are the realisation of interoperability at large. Those systems will have high relevance to policy formulation (data collection as base for decision-making), policy execution (interaction between citizens and government anywhere, anyhow and at any time, e.g. for eHealth purposes, too), and policy enforcement (remote monitoring, e.g. for crime prevention).

5.3.5 Towards pan-European standards & interoperability

Gap storyline brief: Data sharing and interoperable ICT infrastructures are a precondi-

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28. Cf. scenarios "Global networked synchronous and ubiquitous mobile government" and "Privatised zero-stop-shops and media-,democracy' in the Babylonian tower of Europe and Central EU Government frame with local self-organising operational governments" described in more detail in deliverable D 2.1, available at http://www.egovrtd2020.org/

29. ibid.

tion in a common European Information Society. The lack of pan-European standards results in insufficient interoperability of systems, databases and eGovernment services across EU government, societies and markets, which hinders economic growth and free movement of citizens and businesses across Member States.

Abstract: A lack of information exchange can have a high impact on successful service completion and effective communication in any situation to manage. For this purpose interoperability at a technical, semantic and organisational level should be ensured. Much research and projects have already been conducted in this field. This has solved many of the technical-oriented problems and national standards for supporting interoperability in certain domains are established. Despite all these efforts interoperability and especially pan-European interoperability and interoperability among agencies at different levels and in different domains remains problematic. There is a lack of coordinated activities towards joint development and application of international standards, including the assessment of economics, impact and public value of applying common standards in the public sector. Common European eGovernment ontology and an agreed-upon European eGovernment glossary are not established, which creates a tremendous barrier to semantic interoperability of systems. How to secure that systems are interoperable across governments, societies and markets on all levels of interoperability (technical, semantic, and organisational)? What is still lacking in current investigations of standardisation and interoperability? Why do these approaches fail? Proper methodical approaches to master interoperability successfully are lacking. What role plays SOA (service oriented architectures) thereby - is this the ultimate solution? How can governments migrate effectively and efficiently with the burdens of a huge bunch of legacy systems? Lack of economics and interoperability across borders in government services results in missing activities in paving the way to a single European market.

Gaps covered in this storyline: (1) *Interoperability standards* and the complexity of providing organisational, semantic and technical interoperability across systems in a pan-European dimension are still not fully resolved issues. E.g. (2) *Central EU eProcurement* is not achieved yet, as this requires rationalisation of procurement processes of Member States' practices and laws. Furthermore, current investigations of pan-European eProcurement procedures lack consideration of efficiency and effectiveness. Likewise, (3, 4) *Interoperability among cultures and government systems in society* and the diversity of EU Member States are key issues in terms of Europeanisation and European citizenship. Social and cultural interoperability of public services – thereby respecting cultural diversity across EU Member States - is not yet researched and understood well. (5) *Peer-to-peer* is a gap, which addresses the need for more interconnectivity between existing ICT systems and the impact of peer-to-peer systems on eGovernment efficiency. (6) *Service-oriented architectures (SOA)* bear a great potential. However, their full implementation in government networks is still missing and demands more research.

Storyline towards ideal futures and potential solutions: There is a continuing need for standards, improving semantic and organisational interoperability and ensuring the information and service sharing among public and private organisations. A lack of interoperability can have a tremendous impact on society and the market, therefore the value and benefits of interoperability should be assessed. As some future scenarios[30] predict the full interoperability of databases, systems and government eServices in the pan-European level, more efficient and effective government operations shall be achieved. An

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30. The scenarios are "Human centred government" and "The new eWorld order" - section 4.2.5.

example is the full implementation of a central EU eProcurement which would create the basis for equal and transparent market opportunities for all actors at a European level. There is also a strong request to make other services interoperable at pan-European level, such as eHealth, eTaxes, eEducation and others, as free movement of people is a desire and strategic goal of the EU. Strong EU-wide cooperation among governments, technology and ICT service providers is expected to achieve full interoperability of services. In this context standardisation issues need to be addressed and harmonised at the pan-European level.

Assessment of gaps: Although a lot of attention is already been paid to interoperability, the gaps in this storyline were assessed as very high and relevant according to the eGovernance model. Interoperability-related problems need to be solved on the short term and were assessed as highly relevant in order to enable new applications and effective information sharing across government and public-private-civic sector networks in public service provisioning. After solving these immediate problems the emphasis will shift from technical and semantic interoperability to cultural interoperability, which was considered as less urgent by the experts in the roadmapping workshops (see chapter 6). However, partners of eGovRTD2020 perceived interoperability and standards as well as standardisation of government eServices are very important for further developments towards a powerful European society and market.

5.3.6 Value of ICT-investments and ICT-dependency

Gap storyline brief: There is a tremendous lack of coordinating and governing developments in electronic service provision, leveraging and re-using technological solutions already available (instead of investing in new ones) and learning from the others. Apart from that, the impact and consequences of ICT dependencies, and how to govern effectively disasters probably due to a lock-in to a specific ICT application, are not well understood.

Abstract: It is expected that the distribution and coordination of governance functions between centralised and decentralised levels of public administration are changing over time due to large investments in common ICT infrastructures. How public administration can take advantage of modern ICT, and how ICT can facilitate and enable new types of governance of public eServices is not yet investigated properly. Likewise, the potential impact of ICT on the governance of public services is not well understood. The dependency of governments on a proper functioning of ICT most probably not under supervision of governments providing the services is a risk, whose impact and dimensions are not yet investigated properly. There is a need for more research on the consequences of distributed and remote eGovernment applications and the governance of public eServices in general. The implications of IT governance of public online services of general interest (e.g. eHealth), which might improve the life of citizens and the operation of companies when their activities cross national borders, are urgently required; e.g. who should govern such large-scale ICT applications? Most scenarios of eGovRTD2020 assume higher ICT-dependency within a networked society. This means that the proper functioning of the whole society becomes more dependent on ICT, including public services. How to improve reliability, security and robustness of the Internet infrastructure is a key question, to which no answer is provided at the moment. Is there a responsibility of Governments to guarantee proper functioning of the Internet in a fully networked society? If so, what means and actions are required by governments?

Five gaps are covered in this storyline: (1) *Governance in service provision & Role of*

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government in service provision refer to the lack of properly investigating business models on in-house or outsourcing public service provisioning, and how to effectively govern distributed online service provisioning via effective deployment of ICT. With the wide deployment of ICT, (2, 3) *New types of [IT-]governance* appear, which need proper investigation of the impact and consequences as well as the added value of change. (4) *ICT dependency:* There are currently hundreds of millions of computers connect to the Internet, generating several petabytes of traffic a day. Hackers or terrorists might select this infrastructure as a target to disrupt economic activity. Current and future ICT-dependency and the highly probable risks of disruption by hackers and terrorists are pressing issues to enhance and ensure the reliability, security and robustness of the Internet infrastructure. (5) *Proprietary software used by society* refers to the challenge of integrating current open source software with proprietary software solutions. Obstacles, challenges and benefits of both business models coexisting for the sake of competition and to increase ICT quality and innovation are not well understood.

Storyline towards ideal futures and potential solutions: Modis (2005) predicts that, in a few years, the Internet rush will be over, because penetration will be exhausted. However, most scenarios in section 4.5 foresee that the Internet will further grow rapidly. Consequently in the future, the economic system of the EU and its Member States will become more and more dependent on the Internet infrastructure, ICT and applications. Information systems based on the Internet as the primary infrastructure will run most public and private services, which generates a tremendous dependency on the proper functioning of this infrastructure on all side of actors – private, public and civic. Research must be carried out on various aspects of measurement and reliability of Internet infrastructures, and predictability of potential crashes. The impact of such a breakdown of the Internet on public and private economies is not well understood; - And who will be responsible in the case of a fatal breakdown? Preventive measures require early identification of potential failure modes, and measuring effectiveness of required counter-measures. Fundamental knowledge about Internet structures, the performance and mechanisms to improve the reliability, security and robustness of this infrastructure is still lacking. From this, a need can be derived regarding the permanent monitoring of service execution over the Internet to ensure that organisations can account for their activities via the Internet. Besides securing the basic infrastructure on which electronic public service provision relies on, several scenarios mention public services outsourced to private companies with governmental regulation and monitoring of these activities. A service portfolio is needed that depicts the outsourcing potential of public services and the mode of governance of these services. How the quality of these services might be enhanced through technology and to which degree is the impact of technology on the choice of governance for the service a relevant topic? The problem of the scope of government services versus the quality and sophistication of these services might be raised. Some scenarios describe a government limiting itself to its core services (e.g. security, justice, defence, administration of civil life, education), while other scenarios describe a government providing many additional services. Besides that, scenarios foresee that within government, some functions and services will operate at local, regional, or national levels, while others will operate at the European level. New types of governance of ICT-enabled pubic services become necessary with a different degree of centralisation and decentralisation. Coordination to achieve a good balance between tight control and autonomy requires proper investigation of governance of public services. Exploration of new types of IT-governance mechanisms is needed to deploy shared and distributed

public services through the upcoming networks and to manage the resources needed for the efficient and effective provision of public services relying on ICT.

Assessment of gaps: In a world in which governments seem to become more and more networked both within and across national borders, the importance of [IT-]governance steadily increases. In particular the EU is affected by these developments and will have to face these issues in future. A general prerequisite is to develop a proper technical infrastructure to guarantee a smooth running of the whole front- and back-office service systems and ensuring the interconnectivity of systems among organisations of various kinds within and across countries of the EU and beyond. Therefore, assessing the value of ICT investments and understanding ICT dependency is a big challenge for eService provision and consequently was assessed as highly relevant for eGovernment in order to prepare current governments for meeting the requirements of modern and innovative governments in future.

5.3.7 Goal-oriented, value-added public service provision at all levels of governments

Gap storyline brief: There is a lack of understanding on concerning what kinds of services can/ should be provided at the local or central (or even European) level of governments in the future. It is necessary to improve the cost-/benefit ratio of public services and the flexibility of the portfolio of these services.

Abstract: How can governments reform themselves from within? What reforms are lacking and are consequently needed, and for what benefit? In a fast changing environment with limited budgets and ever more responsibilities and challenges of the public sector, a proper understanding of the rationale and range of public services provided at the various levels of government needs to be gathered. Cost-benefit analyses need to accompany the service portfolios of governments – both, for traditional service provision as well as online offers. Likewise, the potentials and consequences of outsourcing and sharing service offers across government levels, and with private and/or civic sectors, need to be analysed to meet the right expectations for value-adding public services and mission-oriented governments.

Gaps covered in this storyline: (1) *Centralisation of service provision at national level vs. competition in regions*, (2) *Centralised / decentralised storage* and *(3) Reform of public administration* refer to the need to find the right cost-efficiency and public value balance of service offers at the right government level. Depending on the trends of government structures (cf. Gap storyline in section 5.3.3), a proper investigation of the level of service provision, the underlying mission of a public service, and the value-add to be provided are required. Such studies are currently not performed. In specific, the interdependencies and consequences of each potential alternative are not understood well. Likewise, the tendency towards networked governments (cf. Gap storyline in section 5.3.1) requires a proper goals-oriented service portfolio and performance investigation. Going a step further, the potentials of (4) *Using ICT to redesign government structures and processes* have to be examined carefully. ICT can be a driver for modernising governments. Yet, a proper goals- and performance management has to accompany such endeavours. Finally, a gap indicates that understanding is lacking on the impact and consequences if (5) *Local governments arrange healthcare*, which was identified as a potential future scenario. What would be the competencies and resources needed, and what would be the rationale to govern healthcare at the level of local governments? What would be the benefits and difficulties resulting from a lack of central coordination and steering?

Storyline towards ideal futures and potential solutions: Various scenarios[31] assume that governments will face new challenges as the context in which they will operate in the future changes. Several challenges confronting governments can be resolved better at the EU level (environment change, natural resources, transport regulation, international trade negotiation, security, prevention and fight against organised crime, immigration, etc.) than at the Member State level. It is important to achieve a better understanding of the right level of management and policy formulation. The portfolio of public services will need to be more flexible in order to adapt to unforeseen challenges. As a consequence, methods to analyse the decision criteria for maintaining a public service at a certain government level or not should be developed. In a common European market and society, certain public services will need to be interoperable across different Member State countries and regions. ICT properly used should allow governments at all levels to improve the quality and flexibility of their public services. There is a strong need to identify the appropriate way to use technology to provide a proper portfolio of public services (offered online and in traditional modes). Introducing changes in government is a difficult task for many different reasons: strong culture of public administration, weak technological culture, existence of statutes defined by law, including pay scale, etc. Exploring the conditions for changing public service portfolios towards goals- and performance scales in administration is a relevant research, which implies also leadership at the political level. Harmonisation has been going on in the EU for some time on the market for goods, more recently also on public (e)Services. Again, activities need to be validated towards a reasonable goals and performance assessment.

Assessment of gaps: The reform of the public sector is a very complex but at the same time urgent and important undertaking. Strong administrations' cultures in certain countries, legal constraints etc. hinder progress which is needed due to high pressure from the market and society, large public debts, and the request for increased flexibility and modernisation in public service provision. The gap has been assessed as high in terms of relevance and importance towards the eGovernance model.

5.3.8 Free movement of citizens and companies

Gap storyline brief: Free movement of people, money and goods is a key objective of the EU strategic policies of i2010. This leads likely to high mobility of individuals and organisations, including many travels and frequent changes of jobs or seats of companies. The challenges and barriers governments will have to solve when European citizens and companies will become more mobile are not yet well understood. In some cases governments of the single Member States have started to collaborate, for instance in law enforcement and healthcare. Yet, many more issues have to be solved to foster the transformation process of governments towards enabling a single European market and information space with high mobility of people, money and goods. The implementation of the EU service directive is an example, where not everything is in place, hence requiring better understanding of its consequences, organisational and technical preconditions, and impact on eGovernment services.

Abstract: Some scenarios describe an increase in the number of movements of citizens and companies. Current eGovernment research and strategies do not cover the chal-

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31. Cf. Scenarios: "Ambient government", "Government keeps on trying" and "Social state" in section 4.5.

lenges eGovernment will have to face if European citizens and companies continue moving from country to country and if the percentage of these movements becomes more significant. In some cases, Member State governments cooperate in the domains such as: law enforcement, healthcare, transportation infrastructure, which have an impact on the movement of people and organisations. Yet, there are many additional issues which could be considered to support citizens' and companies' movements.

The gaps covered in this storyline: Main focus is on problems arising for eGovernment from *(1) EU-expansion (2) Europeanisation, and* (3) *Geographic borders disappear*. Research is needed to identify and develop business models which cover the challenges eGovernment will face when European citizens and companies become more mobile, and Europeanisation increases. Likewise, the EU-expansion policies have to be carefully investigated in terms of the consequences for eGovernment structures in new Member States and 'old' Member States. Factors such as diverse languages, national laws, level of economic and ICT development, dominant culture, etc. have an impact on interoperability and compatibility with the already established EU circumstances. These impacts are not understood well so far. Furthermore, common norms and regulations have to be adopted by the new Member States, and the corresponding portfolio of public services has to be expanded on both sides in order to provide equal opportunities for citizens and companies to freely move. Several scenarios expect a rise of (4) *Competition among governments / regions / nations* is a consequence of these developments (see also gap storyline in section 5.3.3). The impact of these developments on government and government structures need to be investigated thoroughly. Identification of future needs which might result from those developments and the role of ICT as both trigger and solution for these developments are required.

Storyline towards ideal futures and potential solutions: Scenarios[32] indicate an expected higher movement of citizens and companies, which requires cooperation of all Member States to prepare for newly emerging service needs. Increased travelling of people, who change jobs and life-style more frequently, will become true. Hence, governments need to work together to set up a proper environment and framework for enabling a more frequent moving of citizens and companies across Member States. eServices will be requested to become available without time and geographic limitations. Identities will need to be accepted across countries within a common European space. Likewise, electronic certificates will have to be accepted across countries. Finally, social security systems, pension systems, taxation systems, etc. will have to be harmonised across Member States to lower the barriers of transformation from one State to the other.

Assessment of gaps: The right of free movement of people and organisations comes up with new challenges for every government within the European Union - and worldwide, too. This trend will continue and will have high impact on policy formulation, execution and enforcement in a growing global world.

5.3.9 Government's (re)action to challenges linked to large socio-demographic changes

Gap storyline brief: The role of governments in mastering large socio-demographic changes like migration, ageing, or a lack of workforce is unclear. Preventive and proactive measures are barely undertaken. In specific, potentials of ICT to resolve the challenges

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32. See for example the scenarios "Individualised society", "Ambient government", "Government keeps on trying", and "Social state" in section 4.5.

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are not investigated properly. Tabooing the tremendous challenges ahead of us will result in large disruptive effects, which will lead to instable markets, a decline in economic growth and high risks to negatively influence the quality of life and stability of society.

Abstract: In many scenarios, socio-demographic changes like massive migration of workers, ageing, lack of workforce and other disturbances of the environment such as religious wars and tensions were identified. These socio-demographic changes and specific tensions might result in a disruptive environment and are a concern of many countries and politicians. How should governments react and prepare for these challenging changes? What is the role of government in mastering such large demographic change? And which measures, laws, policies and technologies can be explored by governments to govern such socio-demographic changes?

The gaps covered in this storyline are (1) *problems with social security and pensions*, (2) *cultural convergence and slow down*, (3) *old people rule*, (4) *immigration*, (5) *ageing*, and (6) *religious wars and conflicts*. These issues have been raised in several scenarios[33], and resulted in one key dimension of scenario clustering: the environment. Demographic changes and tensions might result in a disruptive environment. Respective policies are missing to deal with such factors disturbing the environment. Most of the socio-demographic changes can hardly be contained by governments directly. Nevertheless, proactive measures to prepare for such changes are required, such as new types of services for the elderly; exploring all kinds of technology to ensure that cultures understand each other; enabling a rapid reaction to events disturbing the stability. The impact of these socio-demographic influences on the future is barely understood, and cannot be assessed with current methods and means. To enable politicians to take appropriate measures to avoid that these changes might result in economical decline and societal conflicts, proper instruments have to be developed to proactively identify socio-demographic disturbances and to master them effectively.

Storyline towards ideal futures and potential solutions: Demographic changes influence the environment and might result in either a stable or disruptive environment. The impact can often be predicted and some of the European countries are already taking measures to deal with an ageing workforce, immigration and religious tensions. Yet, these measures often remain at the national level, whereas it concerns the whole of Europe or even the whole world. As such an integrated European vision and policy might better be able to deal with this.

Assessment of gaps and gap storyline: The demographic changes were assessed as high as it might disrupt the society and economy. There is consensus about the need for dealing with them in terms of laws, regulations, policies and technology exploitation that goes beyond the national level.

5.3.10 New technologies for automatic monitoring and surveillance to provide security

Gap storyline brief: There is a lack of understanding of the potentials and impact of new technologies in monitoring, tracking and surveillance of persons, communications and goods by governments in order to guarantee public safety and security.

Abstract: Modern ICT and built-in devices open many opportunities for data gathering, its use and provision, also in the field of eGovernment. For example, advanced sensors,

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33. The scenarios are: "Orchestrating government", "Ambient government", "Incident politics", "Social state", and "Empowering state" – cf. section 4.5.

RFID chips and image/voice recognition technologies enable automatic monitoring and sophisticated surveillance. Can governments take up the advantages of new technologies for the purpose of providing advanced security and safety, and to provide these public duties more effectively and efficiently? How RFID and other automatic monitoring means can be exploited for the benefits of society (public value) in crime prevention and in guaranteeing security in order to enable government activity to be more effective and efficient is not well understood. Proper business models confronting the trade-offs among individual privacy and public value generation when using such advanced monitoring and surveillance technologies in providing public security and safety have to be developed.

Gaps covered in this storyline: (1) *Automated monitoring and enforcement* refers to the gathering of personal information and its legal usage in particular circumstances (e.g. to guarantee safety of the general public or to prevent crimes). Privacy and security issues of automated monitoring for data collection and law enforcement need to be investigated in more detail. In particular, which data is gathered, and what service is secured, has to be assessed in terms of public value. (2) *Embedded chips and (3) Implanted technology devices* are possible scenarios for identification, authentication and authorisation procedures e.g. for health records, personal identity, money transfers, etc. ICT is available (e.g. embedded chips) for future expected applications. Lack is mostly detected on the side of current non-technical barriers such as legislation, social issues like trust and confidence, morale and ethics - e.g.: What impact on society and individual behaviour do implanted chips create? What will be the public value? Which other possibilities exist to avoid implantation of chips, but to achieve the same goals? Even if the use of implanted chips was mentioned in scenarios, this possibility was stated as unwanted. *(4) Remote monitoring* bears a great potential to implement large-scale monitoring and surveillance of law enforcement and crime detection, or in healthcare. Only initial steps of implementation are done. Further research is needed to explore the potentials of such technologies. *(5) Limited freedom* is a means of the impact of eGovernment to guarantee any kind of freedom, e.g. freedom of speech through the Internet. Automatic monitoring and data gathering raise strong threats regarding the privacy issues and also freedom itself. In general well-informed people are rather in the position to save their rights and freedom than people who are not informed. On the other hand people might give up some certain level of privacy to get efficient eGovernment service provision. Implications are not well understood, yet, and require further research.

Storyline towards ideal futures and potential solutions: Some scenarios[34] predict that more and more data will be automatically gathered through various ICT and devices. Monitoring of almost everything is expected by 2020. Data collection and citizens' monitoring lead to networked administration. In this vision, laws and regulations are seen as being immediately enforced. Enforcement tasks of government would be accomplished through ambient sensors and inter-domain data couplings. To achieve this vision, thorough investigation of smart environments and ambient ICT technologies for monitoring and surveillance are required. The implications on basic human and civic rights and laws concerning the use of images and data of persons have to be investigated. It is far from certain that privacy mechanisms alone can ensure that information is not misused. The human and basic rights of individuals have to be legally protected and there is solid ground here for important research. More research is needed to identify and apply possible solutions in this field in the future. Above all, impact assessment and analysis of the

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34. The scenarios are: "Incident politics", "Social state", and "Empowering state" – see section 4.5.

implications of wide-spread monitoring and surveillance on society and market have to be performed.

Assessment of gaps: The gaps of this storyline were assessed as highly important and highly relevant for policy enforcement (monitoring, crime prevention and prosecution), as well as policy execution in cases of explicit identification purposes and service delivery. Legal frameworks to protect human and basic civic rights related to automatic data monitoring and surveillance are needed. Also standardisation issues and privacy concerns need to be addressed.

5.3.11 Advanced technology in crime prevention and crisis management

Gap storyline brief: The opportunities new technologies bear for terrorism and crime in the virtual world and in the real world by effectively coordinating crime via ICT are not well understood. Also, a lack of understanding of the potentials of ICT in crisis management and emergency recovery has been identified. What is the role of governments in managing the new threats and risks or dangers for individuals and organisations in the virtual world? What technology do governments need to deploy to be more proactive instead of reactive in crime prevention and crisis management of any kind.

Abstract: How can the executive body and rescue teams benefit from the advantages of new technologies in order to enable government activity to be more effective and efficient, e.g. in crisis management or in preventing cyber crimes and terrorism? As eCrime rapidly increased over the last years, the government's duty is to provide proper protection mechanisms. On the other hand, governments also need to collaborate and react to unexpected events. For that reason, reliable infrastructure should be adapted to manage crises and to support governments in cooperating with the executive body and with rescue teams in emergency cases.

Gaps covered in this storyline: (1) *Crisis management.* Proper responding to crisis management demands strong pan-European collaboration among government agencies and other private or civic emergency teams in order to deal with these emergencies and other kinds of terrorist attacks. There is a strong need in creating of first response systems to deal with attacks and coordination of multi-national efforts to prepare, respond and recover from any kind of disaster situation. (2) *Cyber wars and crimes* demand accelerating development of core infrastructures and Internet security protocols as well as monitoring concepts for managing emerging risks and increased complexity. (3) *Incident politics* express the need of proper governance models for governments to act and steer correctly and effectively when some incidents happen, e.g. terrorists attacks, bio attacks, natural disasters.

Storyline towards ideal futures and potential solutions: In the future new types of natural catastrophes, crises, wars and conflicts might disrupt nations, EU or society as a whole. Conflicts might base on conventional arms, but may more and more also turn to bacteria, viruses and virtual attacks. Scenarios[35] depict conflicts within nations, e.g. initiated by small groups. The type of crisis cannot be forecasted, thus it is difficult to anticipate. Hence, an infrastructure that can adapt to a variety of crisis characteristics and that is robust and reliable is needed. Current research relates to how public agencies can cooperate in real-time to react immediately to all kind of wars and conflicts, both at an operational and at a policy level within countries. The exchange of information requires interoperable systems among all first responders, including hospitals, fire departments and

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35. See e.g.: "Government keeps on trying", "Transition period", and "Empowering state" – cf. section 4.5.

private companies. Simulations and games are necessary to find the problems in current plans and to improve the infrastructure and interoperability of systems. This research is often related to the current field of crisis management, i.e. how to deal with incidents like terrorism attacks, influenza and so on. However, different kinds of crisis situations are expected to appear at a European or even worldwide level in the future. Research should also focus on related domains like psychological, societal, institutional, legal or economic aspects which can prevent eCrime.

Assessment of gaps: As effective research is needed to develop concepts, methods and tools to detect and counteract corruption, crime and terrorism and to further explore opportunities for government collaboration in unexpected situations, the gaps clustered in this storyline are assessed as highly important and relevant to the eGovernance model.

5.3.12 Securing transparency, trust and data privacy

Gap storyline brief: A lack of proper understanding of the consequences of data mis-use, of a negligence or violence of privacy, of who owns and processes information or data for criminal purposes, and the lack of effective tools applied in eGovernment con-texts to avoid such criminal acts on data privacy were encountered. What must be done to secure transparency and trust, and to provide the right level of data access and data privacy, including eParticipation and decision making in politics?

Abstract: There is a need for better understanding conditions of access to data and use of these data so that the rights of citizens and organisations which are guaranteed by law can be protected and enforced. Proper analysis of the contexts in which government can legitimately use ICT to provide value-added services is lacking. Ways to create value out of public information produced by the various administrations or public organisations does not seem to have been the object of systematic study.

Nine gaps are covered in this storyline: (1) *Data access and regulations* addresses issues of data regulations, accessible through the Internet. Such regulations are still in their initial stage and have to be enhanced. (2) *Digital rights, (3) Information access and transparency, (4) Intellectual property, and (5) Information ownerships* refer to chal-lenges in order to set up a common regulatory framework which is transparent, rec-ognised and enforced worldwide and which provides the respective data privacy, and rights of (intellectual) property in the virtual world. Restrictions and requirements to overcome these gaps need extensive and careful research. *(6) Transparency* is closely linked with data privacy, digital rights, intellectual property and data access regula-tions. Identification of public data and services, and open information as to who has access to, and who uses one's private data or (intellectual) property are preconditions for trusted governments. Comparative analyses of the legal texts related to transpar-ency and data access, digital rights and information ownership seem to be lacking. Furthermore, generating added value out of public information does not seem to have been the object of systematic studies. Beyond these gaps, *(7, 8) Privacy and security* should be considered in these contexts from different aspects: psychological, societal, legal, institutional and economic aspects of using ICT to provide an acceptable bal-ance between security control and privacy protection. *(9) Legitimacy and trusted State and politics in decision-making* tackles the eParticipation issues and assuring trust in governmental institutions.

Storyline towards ideal futures and potential solutions: Several future scenarios[36] em-

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36. For example the two scenarios: "Ambient government", and "Incident politics" - see section 4.5.

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body the visions of transparency of administrative procedures, public information and creation of a transparent government. Transparency is related to the access to public data generated by government and other public organisations, to private data collected by government on citizens and organisations (e.g., fiscal records of citizens and companies, medical records of citizens) and to the procedures used by public administrations. In order to achieve ideal futures, research is needed to identify which are the public datasets and services of general interest for which access and transparency are important. In addition, a comparative analysis of the legal texts related to this question seems to be lacking. To avoid data misuse, neglect of violence and assure the proper level of data privacy the methods and tools of data gathering, management and its provisioning should be implemented. Furthermore, handling and dealing with information ownership should be properly investigated. It requires changes in the current regulatory framework in respect to available technical facilities and the social background (i.e. a Digital Rights Management framework).

Assessment of gaps: The gaps of this storyline were assessed as highly relevant and important for policy enforcement, as well as policy execution as being very important for the future development of effective and efficient – and trustworthy – eGovernment services, which will be beneficiary for the whole society.

5.3.13   Access for all in an inclusive society

Gap storyline brief: The divide between those who have and those who have not can remain a gap in the future.

Abstract: Social and digital divide, reaching and involving people, and providing high-speed access to the virtual world and online public services are ongoing problems. Ideally everybody has the same facilities and ability to interact with government, but even in the future this might not be true. Although there is plenty of research in this field, the divide remains a problem and appropriate measures to address and solve social and digital divide are still immature.

This storylines covers the gaps (1) *level of inclusions*, (2) *broadband*, (3, 4) *digital and social divide*. Ideally all people have equal access and have a minimal ability to be able to use technology means to communicate with government. In most scenarios this is implicitly assumed. Only in the case of distrust in government the constituents might not be able to communicate with government. The social divide is mentioned much more often, between skilled and non-skilled and between those who have and those who have not.

Storyline towards ideal futures and potential solutions: Most of the technology-driven elements seem to be solved in time by having broadband access, easier-to-use interfaces and so on. Measures to overcome the digital divide are to provide equal and large-scale access to data, and the corresponding ICT. In some scenarios[37], only a few people will be able to operate complex data and information. Hence, the need for well-operating information and knowledge management systems based on artificial intelligence is mentioned as a potential solution. The main concern in the future seems to be the social divide, which might even result in a disruptive environment. A large divide might result into riots and isolation of groups. A sound and fair education system, social systems operating well and treating all individuals of a population equal, and other social and economical measures are the main type of solutions to deal with these gaps. Policies and regulations to ensure equal access and connectivity for all have to be settled. The role

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37. See the scenarios "Transition period" and "Incident politics" in section 4.5.

of ICT in an all inclusive society which provides government services for all in the same quality and under the same conditions, even through different modes of interaction need to be understood better and, hence, requires further investigation. In some scenarios the digital divide threatens society. Measures to minimise the risks and damage of digital divide need to be put in place. Impact assessment and proper strategies have to be developed.

Assessment of gaps and gap storyline: The assessment of this gap is medium, as much research is going on in this field. Nevertheless, this topic is highly relevant for policy formulation, execution and enforcement, as well as for technology developments in the public sector.

5.3.14 eParticipation

Gap storyline brief: There is a lack of a common understanding of the concept of eParticipation and how it can become a successful supportive mechanism to strengthen democracies.

Abstract: A number of questions still remain unclear in respect to eParticipation: Why has eParticipation not yet succeeded, and which policies, measures and tools are needed to turn it into success? What is the impact, who impacts, who is actor, how to secure inclusion, how to exploit new technology, how to overcome current deficiencies of development? How to overcome the lack of commonly understanding the concept? How to overcome the mismatch between the potentials of technology and the needs of the participatory processes supporting a certain mission of participation? And how can upcoming trends such as social tagging, folksonomies, new internet community concepts, etc. successfully be deployed in eParticipation? Current research has a focus on participation tools and applications of ICT in the participatory processes. Organisational, social and political barriers are not properly investigated to counterbalance the technical advancements. Yet, eParticipation is multidisciplinary in nature, and the ICT is only an enabler of a mission: democratic decisions in whatever context. Hence, more insight on the willingness of citizens and organisations to participate in democratic decision-making thereby using ICT toolset is required. Further investigations are needed to determine the relation between active participation and the changing landscape of governance (evolving role of private sector in public services provision, role of political parties, etc. – see further gap storylines in this section).

Six gaps are covered in this storyline: Several scenarios[38] mentioned that steady extension of Internet penetration might lead to (1) *Virtual borders and citizenship.* A borderless EU is not yet realised. In the future, new virtual borders might appear and existing borders might vanish resulting in citizens becoming members of different communities separated by virtual borders. No current research deals with issues such as: What is virtual citizenship? What kind of virtual borders exist now and will come into existence in the future? How will those virtual borders affect citizenship and governments? (2) *Communities of internets politics, and* (3) *Community Society.* Despite all efforts governments have difficulties to keep citizens engaged in community discussions, especially on politics. On the other hand, the trend to community building in social – and even virtual social – matters grows. People are more and more forming virtual communities to share thoughts on topics of interests. Research is needed to better understand the forming of

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38. The scenarios are: "Individualised society", "Incident politics" and "Government keeps on trying" – see section 4.5

virtual communities, especially in order to re-engage citizens through eParticipation. The whole bunch of opportunities in virtual communities needs to be better understood from a socio-technical perspective. Likewise, the technologies needed to support the various community activities have to be investigated broadly to better explore technical innovations. (4) *eParticipation*. Beyond what has been indicated in the gap storyline brief and abstract, eParticipation projects have not yet passed the pilot phase. Many countries are disappointed about the limitations of current solutions. The gap here is that ICT usage in democratic participation has not been properly researched yet. Much of the work is fragmented and knowledge about good and bad practices, as well as lessons learnt, is not shared. Evaluations of the impact of eParticipation projects are not carried out. There is lack of understanding of which indicators to apply for such evaluations of impact. Participation deciding upon and relating public issues might engage visualisation of the problem and problem solving methods via (5) *Simulation & Gaming*, which is not yet exploited well in this context. Besides, looking at current developments within democracies there is (6) *High media impact of participation*. The use of media to inform people about political parties, programmes and politicians requires proper understanding of the media competencies and impact assessment on the public opinion.

Storyline towards ideal futures and potential solutions: In certain scenario-building workshops the participants disagreed concerning citizen participation in political issues in the future. On the one hand two scenarios ("Individualised society" and "Government keeps on trying") describe that people will be tired with participation. In other scenarios it was assumed that people will try to influence the decision-making processes. The scenario "Incident politics" entails that only large communities will be able to influence decision-making. Participation at local level is expected to be more motivating for citizens since at this level citizens perceive that their vote and involvement might result in a higher impact. Consequently, people are likely to be more willing to participate in local government decision-making, since it is their local environment where they are more aware of the quality of their social life. On the other hand, global settings where the citizen does not see directly the impact of his or her participation must be taken care of. At the central government level, citizens might have less direct motivation for direct participation. For a citizen it is important to find out how to use the public services of his or her own government while living in another state. Certain scenarios forecast changes in the political arena with a decreasing role of the political parties and an increasing role of lobbyist. In scenarios where the private sector plays a strong role in the decision-making, online participation could still exist but in a purely formal way and people wouldn't be motivated to participate. Research that could help to understand this negative development of online participation would be useful. More and more democratic processes and participation will be shaped around communities of interests; based on peer to peer networks, blogs, etc. These kinds of new applications and their impact on the democratic processes need to be explored. Additional research is also required to identify potential risks and impacts associated with the use of this technology on democratic systems.

Assessment of gaps: This gap is ranked as very high because eParticipation is fundamental to the political systems. Although there is a lot of research carried out on eDemocracy, problems of political passivity, knowledge management, etc. are urgent requests at present.

5.3.15 Identity management

Gap storyline brief: Electronic identity (eID) management solutions are not yet mature

enough. The impact and consequences of misusing digital identities are not yet clear. It is also unclear what a user can really manage. Questions have to be clarified such as: Is a European-wide unique eID needed? How can eID solutions be made interoperable? How can new technologies such as biometrics, RFID, etc. be exploited without breaking ethic and moral rules?

Abstract: In the context of globalisation, identity management becomes more and more important. In Europe, one European identity system is not yet introduced. A worldwide unique electronic identification and authentication mechanism is not foreseeable. Instead, several heterogeneous identification systems are handling identification for various levels and purposes across Europe and worldwide. No single system for government-controlled identity management is established. Standardisation still remains an open issue. For facilitating a single European economic market and a European citizenship, there is a need for system integration in the EU. The usage of RFID, biometrics and other built-in devices for identification needs to be properly investigated.

Four gaps are covered in this storyline: In order to be able to carry out the highest level of transaction (1) *Identity management* based on the (2) *Use of Biometrics* is aimed at. But research is needed to balance efficiency and privacy. Besides, requirements for the establishment of (3) *One European-wide identification and authentication* and (4) *Worldwide identification and authentication* needs to be addressed and investigated.

Storyline towards ideal futures and potential solutions: Future scenarios[39] draw a picture of one identity management system, which might be viewed as the basis for global economy and development in the year 2020. Even more, some scenario indicates one uniform identity system from all over the world. Biometrics might be part of these systems (e.g. based on DNA identification). A unique online identity system would make the use of online public services very convenient. It would lead citizens of Member States to perceive themselves more and more as European citizens. Europeanisation would be facilitated, too, via an EU-wide recognised identification and authentication system. However as of today, European-wide or worldwide identification and authentication mechanisms do not exist. Future research and development programmes need to explore the use of chips and biometric data for global unique identification. Legal, technical and inter-organisational barriers should be identified beforehand, so that the one European electronic identity to be developed is applicable and compliant to laws and organisational preconditions. Security industry should switch emphasis from "managing ownership for users" to "empowering users" to manage their own data. In addition, worldwide identification requires thorough analysis of the implications and potential infringement of laws, privacy and basic human rights. Some scenarios envision embedded chips to facilitate monitoring and collecting of information via mobile services. The development and deployment of chips (in devices or as implants) needs to be standardised (whatever its use will be: for goods, animals or even identification and tracking of human beings). Current research is not properly investigating the potentials and dangers of large-scale unique digital identification and authentication means.

Assessment of gaps: Worldwide identification and authentication are relevant to eGovernment policy making, policy execution and policy enforcement. There is a need to integrate different information systems, registers and implement identity management using biometric data (or a different not yet known approach) in order to achieve more efficient and secure authentication and identification processes at European and international level.

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39. The scenarios are: "Orchestrating government", "Social state", and "Empowering state" - see section 4.5.

5.3.16 Public-private-civic relationships in public service provisioning

Gap storyline brief: There is a lack of organisational mechanisms for the efficient and socially inclusive public-private-civic relationships in public service provisioning.

Abstract: Existing eGovernment research shows that governments must improve their efficiency. Outsourcing of some public services to the private sector is a possible way to transform government. This is already practiced for the certain services such as water supply, public transportation, healthcare, etc. However, the level and scope of services allocated to governments and businesses is a matter of democratic decision which takes into account dominant norms in the populations of different countries. Since the outsourcing could also have negative implications, the main issue to be addressed is: How can the public sector activate public-private-civic sector relations to provide public services in an efficient way thereby not loosing the steering and governing role of the public sector? How can the risks of commercialisation of public services and customer divide in such public-private-civic sector co-operations be minimised and avoided? So far, standard frameworks for estimating the outsourcing scope of public services are missing. There is also a lack of guidance and of reliable procedures for the selection and attraction of private providers to offer public services under the strict conditions of the public sector.

Four gaps are covered in this storyline: (1) *Lean government* refers to the maximum efficiency, effectiveness and transparency in governance of public service provisioning. In such concepts government, focuses on general issues and provision of fundamental public services, whilst basic services are outsourced to the private sector (cf. also gaps *Outsourcing of public services* (2), and *Services provided by private parties* (3)). Evaluation and impact assessment of outsourcing are missing. Frameworks and methods for assessing the outsourcing scope of a particular public service are lacking. Incentives for the private sector to take part in the public service provisioning are unclear. Proper frameworks and policies need to be developed to enable the public sector to steer service provisioning by private and civic sectors and to undermine the misuse and commercialisation thereby. A lack of comparative legal and policy studies related to this issue exists. (4) In case *Health is privatised* governments might not take any responsibility for the health of their people and leave it up to the private sectors. More knowledge is needed concerning the good use of technology to support the management of health care, and to support the medical personnel as well as the management of organisations in charge of health care, from individual doctors to large hospitals. Research is needed on the evaluation of government policy related to health economics.

Storyline towards ideal futures and potential solutions: Some scenarios[40] describe a model of Lean Government and attribute to this model maximum efficiency, effectiveness and transparency in governance. In these scenarios government focuses on global issues, is responsible for policy making, orchestrates activities and ensures security, privacy, accountability and transparency. Basic public services are provided by private and civic sectors (outsourced), while fundamental ones are left to the responsibility of the government. Government acts as an enabler and motivator in attracting private sector organisations to take part in the provision of public services. The implementation of this governance model needs thorough analysis of the existing public services and determining the possible range of outsourcing public services. Experiences in outsourcing of public services have to be carefully analysed in terms of legal, political and social impacts

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40. Cf. scenarios "Orchestrating government", "Individualised society" and "Transition period" in section 4.5.

and challenges to be addressed. Based on these insights, a standard framework for activating, carrying and controlling public-private-civic relationships could be developed which guides in transforming towards an effective and transparent collaboration among public-private-civic actors in public service provisioning. Such a framework and guideline should also be applied to public-private partnerships in ICT services for governments.

Assessment of gaps: The gaps of this storyline were assessed as high due to many issues related to the organisation of efficient and all inclusive public-private-civic partnerships. More detailed investigation of the outsourcing scope of particular public services and new possible forms of public-private-civic cooperation are needed. A guiding framework for outsourcing and cross-sector collaboration is urgently needed which helps asses the added value and the impact of lean governments. Likewise, steering and monitoring mechanisms of public service provision through private and civic sector are urgently needed.

5.3.17 Changing Public values

Gap storyline brief: There is a lack in understanding and investigating the user side: what are the expectations of the constituencies towards government services, polices and towards State - including the public value of governments' ICT investments and online public services for taxpayers' money? And how will these public values change over time?

Abstract: A change of public values results in new types of relationships among individuals and governments in society. The public value perception and its change over time will have a tremendous impact on nearly all other gap storylines provided in this chapter. For example, eParticipation solutions will only be successful if the key actors (citizens, politicians and other actors) will perceive an added public value in using ICT in democratic processes. Likewise, unique European-wide or international digital identities will only succeed if there is a perceived public value for the stakeholders involved. Even more, advanced technology used by governments in surveillance, monitoring, crime prevention and crisis management will be accepted if society and the market perceive a higher public value (e.g. higher security and safety) than the risks and potential dangers accompanied with the lack of control of such evolutions. Understanding of public values is crucial, as it can have a deep influence on policy-making and shaping of government in 2020.

The only gap embodied in this storyline is (1) *Changing public values*. Scenarios like strong nomadic individuals, developed in a regional scenario building workshops, and individualized society, included in the final set of scenarios, depict visions of the role of the individual in the society in future. Current research investigates privacy and security, autonomy, content awareness, employment and empowerment. Governments need to be aware that they should meet public values. However, public value is a concept barely understood. How to measure public value, when is a public service creating a public value, and for whom? A lack of proper measurement frameworks exist. Also, the relation to the gap storyline on goals-oriented performance management (cf. section 5.3.9) is not properly analysed. New applications like combining information sources and processing information are subject to the opinions and values of the citizens. The opinion and the change of public values over time might affect the potential of ICT-enabled public services as well. Public values may vary from country to country which makes comparison even more difficult. Moreover, as people can get used to things public values might change also over time and need to be continually (re-)assessed. Proper frameworks and methods of analysis, comparison and assessment are lacking.

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Storyline towards ideal futures and potential solutions: Most of the scenarios are based on different public values. E.g. collecting information using new technology (RFID, surveillance and monitoring - cf. gap storylines in sections 5.3.11 and 5.3.12) or combining information sources and processing information for the purpose of creating any kind of new opportunities (cf. gap storyline in section 5.3.19) may change the perception of public values depending on the circumstances of trust, transparency and added values of security, convenience, quality of service, etc. Scenarios like incident politics, social state and empowering state show that values and norms will be different in the future. On the one hand changing public values might result in higher level of transparency and accountability of governmental processes and on the other hand it means people are more likely to lean toward something that is immediately tangible and valuable to them (convenience) rather than something that may be more fundamentally important but is only conceptual until something goes wrong (privacy). The individual will decide about the degree of security and privacy he or she needs in the future. This will depend of the level of the services the user will enjoy and also on whether he or she trusts government agencies. Elderly and younger people may have distinct perceptions of public values. Willingness of people to offer some data will depend on the level of services they get in exchange. Changing public values results in new roles of the individuals in the society. Society can become more individualistic where people take care of their own interest. In general, the scope of public values is not explored well yet. Especially combining sources by different types of agencies situated in different (EU) countries and the relationship with public values is not explored yet. Public values vary from country to country which makes comparison difficult. Moreover, public values change over time which makes it even more complicated. Many current efforts do not take into account that current public values might change over time, which make new type of services possible, for example related to monitoring. Privacy protection is sometimes subordinated to the public welfare and fight against terrorism and might be considerably different from how they are now. Public values should be better understood and the impact on eGovernment should be better knows. It might restrict current applications (cross-organisations processes) but also might provide new opportunities.

Assessment of gaps and gap storyline: The assessment is high, as politicians want to stay closer to the citizens. Dealing with public values requires a proper understanding thereof. Yet, public value is an abstract concept not well understood so far.

5.3.18 Full online availability of public services

Gap storyline brief: There is a lack of online availability of public services. Although many opportunities exist to reduce the physical interaction with governments, users are not yet convinced of the benefits of fully online available public services. A challenge of the future is to overcome the technological, organisational and social barriers to reach full online availability of public services with a high take-up by the users.

Abstract: The full automation of public services described in some scenarios[41] raises legal, social and ethical issues which should be studied. Assuming full automation is possible for certain public services, bureaucratic resistance is likely to occur against front- and back-office reengineering. The methods to introduce modern ICT in public administration in order to decrease bureaucracy and to provide better [face-to-face or online] interaction between administration and citizens when needed should be explored.

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41. The scenarios are: "Ambient government", "Incident politics" – see section 4.5.

Main questions are: how can full online availability be taken up by users? What is the benefit of users, and the public value in general? What is the motivation of users to use the online offers? How to design fully online services which reach a high take-up? What are the needs and consequences of fully technical online availability in terms of technology, organisation, laws, and accessibility, capabilities of people? How can technology and channel convergences be embodied in the online offers without requiring too high technical skills and equipment of users?

Gaps covered in this storyline: (1) *24x7 everything* refers to public administration services as the objective in every current eGovernment strategy. This objective is still restricted to leave a digital notice or at once download information and documents or in seldom cases to initiate a process. (2) *Integration of various modes,* and (3) *multi-channels* express the gaps that innovative ICT represents opportunities for radical changes in the way government operates and interacts with its constituency, whilst the potentials of converging access modes are not exploited well for full online eServices. (4) *Open universal access* is related to enabling citizens to widely accessing and consuming eServices through whatever channel they choose. Such is not available yet. The gap is of particular interest in respect to globalisation and the free movement of people within Europe, where remote access to public eServices needs to be provided (cf. also gap storyline in section 5.3.4). The overall vision would be that (5) *Government is fully present and seamless, but operating at the backstage.* Unfortunately, this vision is far from being realised.

Storyline towards ideal futures and potential solutions: Some scenarios state that governments will continue designing and applying public policies and implement them through public administration. There is a need for extensive improvement of public services through different means including reduction of physical interaction with the bureaucratic apparatus. Even though more and more services are moving to the 3rd or even 4th level of online sophistication, there are no signs indicating achievement of full seamless government (a vision of the scenario Orchestrating government) so far. In the scenario full automation of existing public services is envisaged, whilst physical interaction with government is reduced to a minimum. The scenario Ambient government indicates new technologies for full automation of public services. Legal, social and ethical issues for such fully automated online services provision have to be investigated properly, especially in the case, where this requests sophisticated interaction and exchange of data between existing databases and IT solutions.

Assessment of gaps: The gaps presented in this storyline were assessed as high relevant and important to the eGovernance model, because of the wide range of opportunities offered by innovative ICT. The vision of seamless governments is a driver for eGovernment, which, however, requires convergence and integration of various modes of access.

5.3.19 Information availability and retrieval and knowledge management

Gap storyline brief: How to make information and services available as needed thereby exploiting the new technologies available? Why are ontologies and KM technologies not widely used? How can these problems be overcome and how to proactively innovative public sector domains by exploiting new technologies for the benefits of governments and their constituencies? Potential areas of applying advanced ontology and KM concepts are identified e.g. in the online public service provision, in complex decision-making and in the governing of State.

Abstract: The lack of information availability and difficulties with retrieving exactly the

information required at a certain moment create tremendous barriers in the effectiveness of decision-making and service provision. Whilst a huge amount of information is available online somewhere, proper support of knowledge management (KM) and decision support (DS) tools in government activity is missing. With the development of new ICT, information and knowledge gathering and management have wider perspectives. Efficient information and knowledge management tools for promoting and supporting citizens and companies should be available. Also, new ways of communicating and interacting with ICT systems (and user-friendly devices) to easily access data and information are required. Artificial intelligence systems might handle the information overload. These issues need to be extensively explored in the future. Strangely, many advanced technologies for effective KM are available. However, these are not exploited effectively in public sector domains. The reasons for non-usage and the potentials of effective KM tools in eGovernment have to be elicited.

Gaps covered in this storyline: Several aspects are related to the gap of (1) *Information and knowledge management: a)* Lack of efficient information and knowledge management tools promoting and supporting citizens and companies to operate eGovernment services; b) new ways of communicating and interacting with ICT systems to access data are required, e.g. human formulated questions instead of keyword research; c) need for artificial intelligence systems to handle the information overload to avoid the digital divide when only a few people will be able to access and use the mass of available information, d) how and where could pattern recognition based artificial intelligence solutions make sense to be deployed? and e) a need to create user-friendly devices and interfaces for communicating huge and complex information and knowledge objects through ICT systems. (2) *Decision making technology* refers to the required quality of decision making support and knowledge management through the establishment of an integrated information and management environment. With the fast development of modern technologies, methods and solutions, more research is needed in order to discover how to implement these technologies to get the necessary information for effective decision making. Decision-making software could enable automatic judgments and other automated eServices. (3) *Multi-agent systems*. Current research focuses mainly on software engineering approaches and some artificial intelligence (e.g. distributed problem solving) and the implementation of individual intelligent agents. Multi-agent systems are needed which engage reflexive and deductive skills.

Storyline towards ideal futures and potential solutions: Future scenarios describe expectations of information overload and the lack of human skills to handle it. Information overload is one of the biggest problems in the private and public sectors at present. Currently lots of websites host unstructured content and confuse citizens more than these support users' information search, because intuitive information queries are not always possible and lead very often to the wrong results. Furthermore, digital divide is threatening the society. Only a few people are able to operate complex data and information. Hence, the need for well-operating information and knowledge management systems based on artificial intelligence is mentioned in the scenario "Individualised society". Consequently, future eGovernment research should focus on artificial intelligence including pattern recognition and pattern visualisation integrated in search (semantic web) and guiding (intelligent agents) methods to develop new technologies to filter information, present relevant information only and provide indication about information quality (see also gap storyline in section 5.3.20). Besides, results and handling of data mining methods and devices have to be responsive to user needs and skills. For this reason, socio-technical research

should investigate if these threats can be overcome by empowering citizens through e.g. changes in educational programme, developing user friendly devices and generating any kind of intelligent agents. It seems that integration of various approaches will be needed as for example improving of education programme to empower citizens to benefit from intelligent technical solutions. Socio-technical solution could be based on avatars dealing as personal brokers including research towards multi-agent systems and intelligent agents.

Assessment of gaps: Research towards the implementation of efficient information and knowledge management tools is highly relevant in order to support eInclusion (make interaction between citizens and government possible in the first place) and to provide useful eServices (value added services, indicator of quality of services). In addition, information and knowledge management might also be useful and improve the quality of political decision-making, if the collected and proper prepared data could be processed for these values. The concept of media competences and tools which support these facilities are highly relevant for and will strongly impact policy execution (e.g. Customer Relationship Management), policy formulation (opinion polls) and policy enforcement (e.g. search in criminal activities).

5.3.20 Information quality

Gap storyline brief: Lack of proper quality of information and certified sources of information in an era of information overload. What technologies are needed to cope with the information flood in service provision and decision making? Which technologies are suitable and how can these be integrated?

Abstract: In the information society efficient handling of information overload and extracting of high quality information is expected. What problems do emerge for governments when working with bad information quality, and why don't governments exploit advanced technology and organisational means to improve information quality? How can information quality be improved? What technology could help? What would be an ideal situation?

One gap is covered in this storyline: (1) *Information quality* is related to the effective service provisioning to the citizens and businesses. Nowadays information pollution and poor information might often result in bad or even wrong decisions. In the government context bad decisions lead to inefficiency and thus result in lower confidence of citizens. The availability of qualitative information is of a great benefit to the whole market and society.

Storyline towards ideal futures and potential solutions: In the future scenario[42] governments are expected to provide qualitative information on demand to the whole Society. At the moment research and development towards ICT tools supporting and acquiring information quality are in the initial stage. There is a lack of proper quality of information and certified sources of information in an era of information overload. When systems become more and more connected, low information quality can spread and might even disrupt the functioning of the public administration. The pollution of data in the Netherlands resulted in a large number of social security benefits and subsidy payments to citizens who had no right for this money. Content management, knowledge management, data mining, information retrieval, artificial intelligence, semantic web technologies and ontology developments are helping instruments to manage the overload of information and lack

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42. See scenario: "Human centred government" in section 4.2.5.

of knowledge. Further investigation and application of technologies enabling information quality and supporting decision making processes is needed.

Assessment of gap: Achieving information quality and its provision in the era of information pollution is of a great challenge and importance. Investigation of available technologies and integration of current databases, data filtration, and authentication and verification issues regarding the information access are still needed. Therefore, the gap in this category was assessed as very high important and relevant to the eGovernance model.

5.4 Reflecting results: Towards future research themes

The next step of eGOVRTD2020's overall methodology was to extract the roadmap with the most relevant research themes for the future. It has already been mentioned that during the roadmapping workshops the gaps and gap storylines proposed by the consortium members were assessed and discussed with the representatives from government, ICT industry and consulting, and academia. As a consequence, the gap storylines have been revised resulting in the storylines as presented above.

The storylines evolved from comparing and assessing the emerging research needs embodied in the scenario inputs of the participating experts (see chapter 4) and the current focus of research and governments' strategic eGovernment programmes (see chapter 6). They convey a wide area of future research requests ranging from

- Assessing the ICT impact of eGovernment on government activity, society and the market, to
- Government modernisation in terms of more effective and efficient organisational structures, reflection of the legal frameworks, better ICT exploitation and planning, and to
- Reflecting the overall machinery of government and State in terms of mission-orientation and public value creation as well as to
- Requiring pro-active measures towards securing a stable and secure environment, an all-inclusive society and
- Innovation from within the public sector.

For example, several storylines reflect a need in researching future ICT innovation in government, which will lead to networked governments using ubiquitous government systems to offer goal-oriented, value-adding electronic public services at all levels of governments.

A potential in exploiting public-private-civic relationships more effectively in the public sector service provisioning was identified, too, calling for dedicated studies to investigate the scope, conditions, requirements in terms of organisational changes, technology, legal frameworks, governance and management of such co-operations, benefits and costs as well as the potential impact of such new relationships in implementing public sector responsibilities more effectively and efficiently.

Also large-scale implementation of pan-European standards, interoperability of eGovernment services, databases and systems need to be further investigated, including political-strategic and legal frameworks. Likewise, the value of ICT-investments and an increased ICT-dependency of the whole society call for targeted research in the field of eGovernment.

The quality of information and the anytime / anywhere availability and retrieval of information for all in a single European Information Space (as is aimed at in the EU strategic

Table 20: *Mapping the gap storylines to research themes*

Research themes	Gap storyline
Trust in eGovernment	New technologies for automatic monitoring and surveillance to provide security eParticipation Identity management Securing transparency, trust and data privacy
Semantic and cultural interoperability of public services	Changing power structures and new government roles in the virtual world Free movement of citizens and companies Towards pan-European standards & Interoperability Government's (re)action on challenges linked to large socio-demographic changes Access for all in an inclusive society
Information quality	Information quality eParticipation Information availability and retrieval and Knowledge Management Securing transparency, trust and data privacy
Assessing the value of government ICT investments	Goal-oriented, value-added public service provision at all levels of governments Value of ICT-investments and ICT-dependency
eParticipation, citizen engagement and democratic processes	eParticipation Changing power structures and new government roles in the virtual world Access for all in an inclusive society
Mission-oriented goals and performance management	Public-private-civic relationships in public service provisioning Goal-oriented, value-adding public service provision at all levels of governments
Cyber infrastructures for eGovernment	ICT innovation in governments and ubiquitous government systems Full online availability of public services
Ontologies and intelligent information and knowledge management	Information availability, retrieval and Knowledge Management Networked governments ICT innovation in governments and ubiquitous government systems Information quality
Governance of public-private-civic sector relationships	Public-private-civic relationships in public service provisioning Changing Public values Goal-oriented, value-added public service provision at all levels of governments
Government's role in the virtual world	Legal frameworks Changing power structures and new government roles in the virtual world Securing transparency, trust and data privacy New technologies for automatic monitoring and surveillance to provide security Advanced technology in crime prevention and crisis management
Crossing borders and the need for governance capabilities	Networked governments Changing power structures and new government roles in the virtual world Free movement of citizens and companies Government's (re)action on challenges linked to socio-large demographic changes
eGovernment in the context of socio-demographic change	Changing power structures and new government roles in the virtual world Free movement of citizens and companies Government's (re)action on challenges linked to large socio-demographic changes Access for all in an inclusive society Towards pan-European standards & Interoperability
Data privacy and personal identity	Legal frameworks New technologies for automatic monitoring and surveillance to provide security Securing transparency, trust and data privacy Identity management ICT innovation in governments and ubiquitous government systems Free movement of citizens and companies Access for all in an inclusive society

policies – see chapter 8 for more details) need to be better supported through advanced concepts of ontology, information and knowledge management. This calls for intensification of current research, especially in regards to the large-scale applicability of current technological advancements in a context of many peculiarities, which form the public sector. The advancements of ICT in terms of embedded and ubiquitous systems recall for a reactivation of artificial intelligence and decision support systems research of the 1990s, with particular investigation of the applicability of such theoretical concepts in the area of the public sector.

eParticipation is another area, which needs further investigation on how to strengthen citizen participation via exploiting modern ICT facilities. The issue is related to securing transparency, trust and data privacy, too. New technologies for identity management, automatic monitoring and surveillance are expected to be used to provide security, to prevent from crime and to effectively support in crisis management. How technologies can effectively support government activities in their endeavours and how the technologies explored add value in the whole model of State has to be better understood. Impact assessment, comparative studies and innovation research are among the measures that can be deduced as means to investigate the emerging research themes.

In order to assure free movement of citizens and companies in the single European market, legal frameworks and semantically interoperable online eGovernment services will need to be available at a common European level. Proper government (re)actions in facing challenges linked to a large socio-demographic change will be demanded.

Finally, it has to be stressed that the gap storylines are strongly interrelated, which is a consequence of the holistic view and comprehensive methodology applied in eGov-RTD2020. None of the gap storylines can be considered in isolation. This also applies to the emerging research themes that will be presented in the next chapter. Likewise, there are traces from the issues identified in the state of play and scenarios, via the gap analysis to the research themes. Traces from the scenarios and original research gaps identified in D 3.1 to the gap storylines are depicted throughout this chapter. An overview of how the gap storylines elaborated here feed into the 13 research themes developed in the next chapter is presented in Table 20.

The next chapter reports the roadmapping results, which embark on the gap storylines described in this chapter thereby streamlining the needs identified here towards a number of 13 themes for future eGovernment research. The sources for the research themes can be traced through the indications as provided in Table 20, and through the respective scenarios indicated in above described gap storylines.

6. Roadmap for future research and implementations in eGovernment

6.1 The eGovRTD2020 research themes and roadmap
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The visions expressed in the scenario workshops (see chapter 4) have been aggregated into eight scenarios. They exemplify alternative futures that should be considered when drawing a roadmap. Together with the gaps and gap storylines extracted among current research and future visions (see chapter 5), these scenarios were the main input to the roadmapping activity.

In the course of roadmapping, experts were consulted to express their views on the need for future research in eGovernment. The overall methodology for roadmapping eGovernment research applied within eGovRTD2020 was already introduced in section 2.8 and consisted of four iterations in which 11 workshops were conducted and an additional online survey was held. Table 21 shows that in total 340 participants (thereof 232 experts in the regional roadmapping workshops, and 108 online) contributed with their expertise to the regional workshops and the online consultation (see facts reported in Deliverable D 4.1, 2006).

Table 21: *Number of participants per expert group in the regional roadmapping workshops and the online consultation*

	Country where Workshop took place											Online	Total
	AT	ES	IT	DE	NL	LT	SI	FR	US	BE	AU		
Government & Politicians	6	3	8	1	5	7	4	3		14	6	14	71
IT Industry and Consulting	5	12	1	8	7	6	8	2		14	10	19	92
Academia	5	13	4	9	5	6	6	7	20	15	12	75	177
Total	16	28	13	18	17	19	18	12	20	43	28	108	340

In total 11 regional roadmapping workshops were carried out in a short time-span of four months starting in October 2006 and ending in January 2007. Figure 15 shows the three iterations of roadmapping workshops that have been organised.

The inputs gathered in the regional workshops and through the online consultation are documented in the report to work package 4 (Deliverable D 4.1, 2006), which also provides the raw material for this chapter. The eGovRTD2020 project consortium synthesised the contributions and extracted the following thirteen research themes, each with a number of activities for targeted actors:
- Trust in eGovernment
- Semantic and cultural interoperability of public services
- Information quality
- Assessing the value of government ICT investments
- eParticipation, citizen engagement and democratic processes
- Mission-oriented goals and performance management
- Cyber infrastructures for eGovernment
- Ontologies and intelligent information and knowledge management
- Governance of public-private-civic sector relationships

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- Government's role in the virtual world
- Crossing borders and the need for governance capabilities
- eGovernment in the context of socio-demographic change
- Data privacy and personal identity
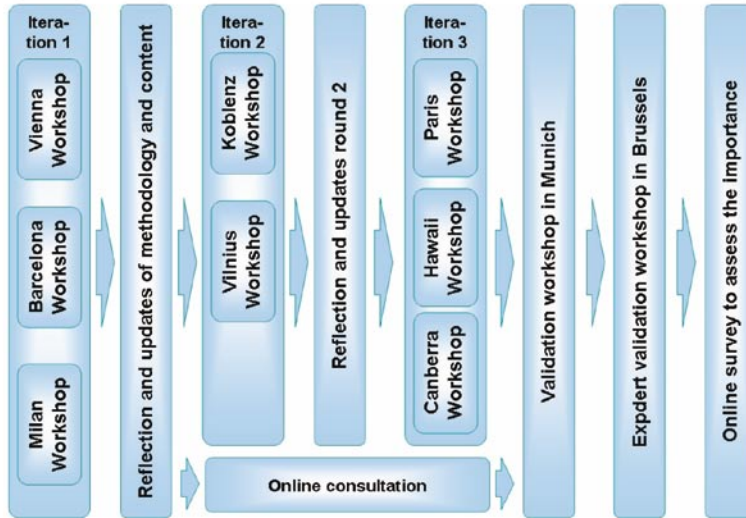
Figure 15: *Evolutionary nature of eGovRTD2020 roadmapping workshops*

The research themes are described in the subsequent section using the following format:
- The theme itself containing the title of the theme, an abstract, key research questions and three keywords;
- The actions and measures to be taken to advance the research theme;
- The actors addressed in order to implement these actions;
- A time span from now till 2020, within which the actions should be implemented; and
- A roadmap for the respective research theme (graphical sketch).

After synthesising the inputs from the roadmapping workshops, the research themes extracted have been exposed to an online survey. A wide range of international eGovernment experts (in total 380 experts) assessed the themes in terms of their perceived importance and relevance. The results are introduced and discussed in section 6.4.

Approximately one third of the experts participated in both, the regional roadmapping workshops and the online roadmapping consultation (N=340, see Table 21 above) as well as the online survey (N=380). Hence, the number of individual experts actively interacting throughout the roadmapping activity in eGovRTD2020 was approx. 480. The outreach in terms of actively participating experts from Governments, ICT Industry and Consulting, as well as Academia in the roadmapping activity was thus very high.

The eGovRTD2020 roadmap provides a powerful communication and awareness creation instrument for strategic decision-makers, who settle the policies for advancing society, governments and industry developments related to eGovernment in their respective environments. With the eGovernment research roadmap at hand, targeted decision-makers at the EU level, national level, ICT industry were asked to prioritise the research related to the scenario hypothesis (cf. chapter 4) they favour, and take action. A reflection of these results is provided in the subsequent chapters 7 and 8.

6.2 Research themes and roadmap charts

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6.2.1 Trust in eGovernment

Abstract: Trust is a fundamental element in all aspects of governments, including eGovernment. The processes by which trust is built, destroyed, used, or abused are poorly understood and differ from one culture to another. Research is needed to understand what conditions are necessary and what mechanisms are needed to build and maintain trust in eGovernment processes and services. In this respect there is also a need to identify the different kinds of trust related to eGovernment, e.g. trust in government or trust in ICT, and its special characteristics.

Key research questions:
- What is trust, and how might trust be created?
- How to increase and secure trust in government in general and in eGovernment in particular?
- How do trust relationships impact the take-up of eGovernment offers, also in different cultural environments?

Keywords: Trust requirements, civic culture, reliability

Table 22: Roadmap for the research theme "Trust in eGovernment"

#	Description	Means	Actors	Timeline
1	Studies to investigate a proper understanding of trust in eGovernment, including: What is trust, and how to create trust? The differences among key trust relationships in C2G, B2G, G2G What kind of trust impacts eGovernment? E.g. trust in government, trust in ICT, trust in jurisdiction, execution and legislation To what degree trust is needed in order to offer sophisticated eServices?	Action research, analysis, desk research	Research with key players from governments with some support of ICT industry & consulting	now -> 2010
2	Develop a framework of mechanisms for monitoring trust between governments and citizens, including: Can ICT enable fair behaviour? What kind of behaviour is acceptable? How to prevent unfairness?	Action research, gap analysis	Governments, research and consulting	now -> 2010
3	Assessment of the risks of a trust framework for eGovernment, thereby identifying both the potential threats and the level of distrust which can be tolerated	Action Research	Research, consulting, governments	now -> 2010
4	Develop a legal basis for implementing a fully trusted eGovernment framework	Legislation	Governments, Consulting, Research	2009 -> 2012
5	Analysis of costs and benefits for fostering increased trust in eGovernment, as well as identifying the investments needed to implement a trusted eGovernment framework	Desk research, Comparative Analysis, Impact analysis, Action Research, Case studies	Research and consulting with key players from governments	2010 -> 2015

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| 6 | Apply the framework of "fair behaviour" Reengineering (rationalisation) of old procedures and rules Pilot cases Benchmarking at micro-level Benchmarking across countries (macro-level) | Pilot projects, Reengineering the conceptual design, Benchmarks | Governments, consulting | 2010 –> 2015 |
| 7 | Development of an international model (Pan-European model) of trusted eGovernment | Conceptual design | Governments, research, consulting and key players from ICT industry | 2013 -> 2020 |
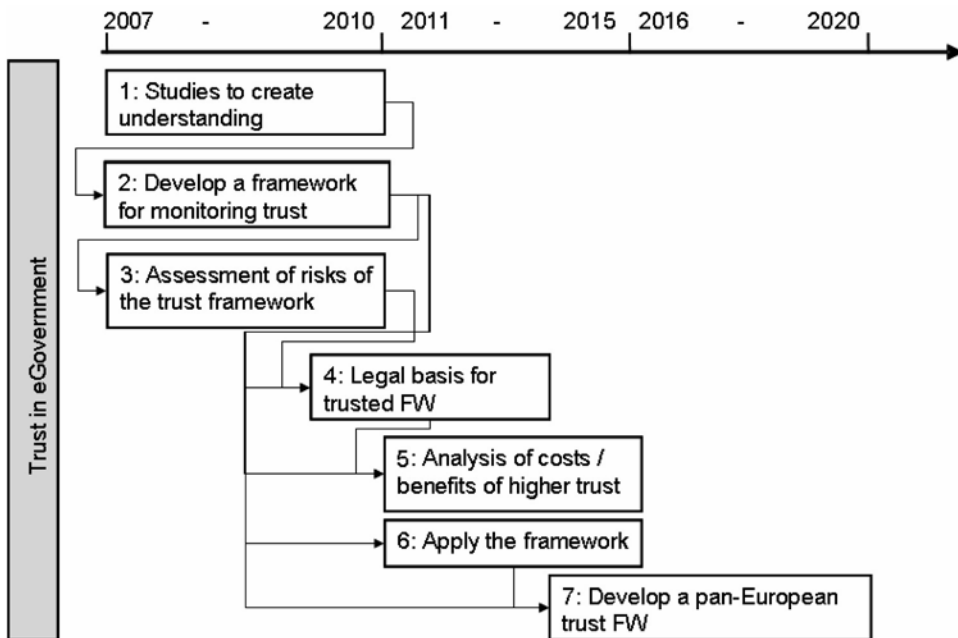
Figure 16: *Phased actions for the research theme "Trust in eGovernment"*

6.2.2 Semantic and cultural interoperability of public services

Abstract: Globalisation and population movements are making societies increasingly multicultural. In principle, increased Internet access and the potential of the web for communication and education should bridge cultural boundaries. Yet, cultural and language differences continue to block effective communication and action across different countries, lobbies, and governmental functions. To facilitate cross-organisational collaboration among the various users, semantic and cultural interoperability are preconditions.

Key research questions:
- How might semantics, ontologies, or other approaches address and resolve challenges in cultural interoperability? How can information systems be modelled and designed, which embody semantic and cultural interoperability?
- How might consistent public services be provided across cultures and languages?

- How can ethnographic and cultural studies support the development and implementation of semantic and cultural interoperability in public administration?
- How can a shared understanding and seamless interoperability of public service design be created among different cultures and communities?
- What are the key criteria of semantic and cultural interoperability, which span across specific domains of governments and reflect e.g. the Schengen Agreement[43]?

Keywords: socio-cultural inclusion, pan-European services, cultural diversity, multilingualism

Table 23: *Roadmap for the research theme*
"Semantic and cultural interoperability of public services"

#	Description	Means	Actors	Timeline
1	Studies to investigate a proper understanding of a semantic model of public services Evaluate the advancement of semantics, ontology and interoperability research in the field Extract elements for a semantic model of administr. Identify possible legal and administrative barriers Identify good practice examples	Analysis, desk research	Research with key players from governments and ICT industry	now -> urgently needed – 2008-2009
2	Study to identify and analyse the key areas of government activity, for which services need to be provided which respond to cultural diversity	Action research, ethnographic studies	Socio-cultural research with societal groups	now -> 2009
3	Piloting design and implementation of culturally independent semantic models of public services as back-end structures, which enable front-end multi-language communication and service delivery	Pilot projects, reengineering, technological design and implementation	Research with key players from governments and ICT industry	2009 –> 2015
4	Develop a framework for measuring multicultural public service delivery Develop criteria for measurement Make framework operational and apply criteria	Research design and user participation in the assessment	Research (and consulting)	2010 -> 2015
5	Analysis of costs and benefits of semantic public services: What are the costs and [social] efforts of not servicing cultural minorities? What investments are needed for good semantic public administrations? What are the benefits of more engaged cultural minorities?	Desk research, comparative analysis, impact analysis, action research, case studies	Research and consulting with key players from governments and ICT industry	2012 -> 2020

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43. http://eur-lex.europa.eu/LexUriServ/site/en/oj/2000/l_239/l_23920000922en00010473.pdf
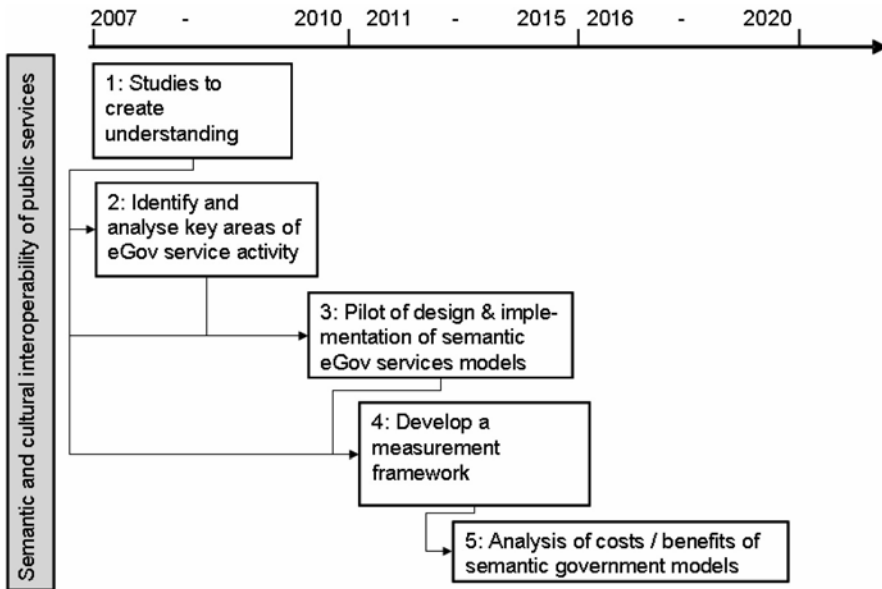
Figure 17: *Phased actions for the research theme "Semantic and Cultural interoperability"*

6.2.3 Information quality

Abstract: Governments, the market, and individuals increasingly need well-defined, timely, accurate, reliable and appropriate information drawn from many sources. In the future, guaranteeing information quality will become both more important and more difficult as the number and variety information sources (including informal sources such as wikis and weblogs) continues to grow.

Key research questions:
- What mechanisms are needed to find, select, evaluate, and authenticate information that is appropriate for a given use [automatically]? How to assess trustworthiness of certain information sources [automatically]?
- How to ensure trust and proper use of information in government decision-making?
- How to certify information sources thereby assuring a certain information quality? What metrics need to be applied?
- What kind of framework is needed to ensure information quality and trustworthy certification mechanisms?
- Which roles do governments fulfil in social webs and in guaranteeing the quality of decision-making?
- How to generate incentives for creating higher quality of information?
- How to engage social networks for ensuring information quality?

Keywords: Information quality assurance, evaluation mechanisms, certification and trustworthiness of information sources

Table 24: *Roadmap for the research theme "Information quality"*

#	Description	Means	Actors	Timeline
1	Study to gain a proper understanding of Information Quality (IQ) within the networked government context, including linking Information Quality with activities and stakeholders: Analyse what is at stake, evaluate existing research Analyse existing frameworks, ontology/ taxonomy/ typology Develop a landscape/ scope of understanding IQ Identify general criteria to assess Information Quality Develop an understanding of the objectives of IQ Link IQ to activities / actors	Action research, desk research	Research with key players from government and ICT industry	now, urgently needed -> 2008
2	Evaluate and measure existing approaches to IQ and test them in the government context	Gap analysis	Research with key players from government and ICT industry	now, urgently needed -> 2009
3	Develop a framework for measuring Information Quality Define measurement criteria Make the measurement criteria operational and apply criteria	Conceptual design and user participation	Research (and Consulting)	2008 -> 2011
4	Apply the framework in practice and continuously evaluate the framework for improvement Implement pilot cases Reengineer the framework based on insights from pilots Frequently monitor, evaluate and reengineer the IQ framework within a given context (micro-level) Benchmark the IQ framework across countries (macro-level)	Pilot projects, updating the IQ measurement framework, and benchmarking	Consultancy and key players from government with support of research (for reengineering)	2010 -> 2015
5	Analysis of costs and benefits of Information Quality What are the costs of weak Information Quality? What are the consequences of good or of bad IQ in government decision-making and electronic public services contexts? Which investments are needed to secure high IQ?	Desk research, comparative analysis, impact analysis, action research and case studies	Research and consulting with key players from governments and ICT industry	now -> 2015
6	Prioritisation of IQ by stakeholders in relation to the intended activities: Investigate, where IQ is more important than in other areas / activities of government, and Who has which perceived IQ importance? Investigate, which mismatches of perceived importance of IQ do exist, and Develop concepts and solutions of how to solve these conflicts of interest	Gap analysis and action research	Research and consulting with key players from governments and ICT industry	now -> 2011
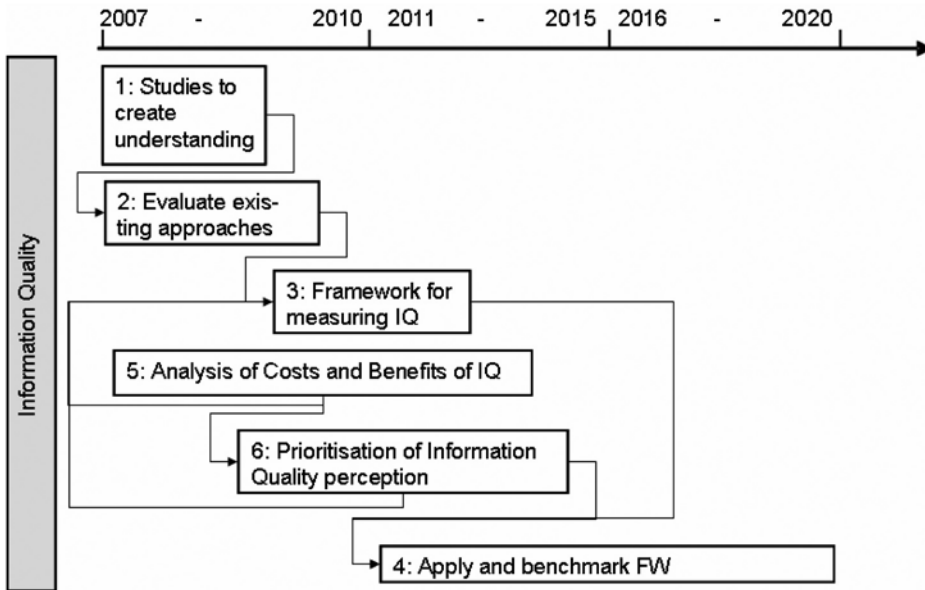
Figure 18: *Phased actions for the research theme "Information quality"*

6.2.4 Assessing the value of government ICT investments

Abstract: After years of substantial investments of public funds, the potential benefits of eGovernment can no longer be assumed, but must be demonstrated. Proper frameworks, methods, tools and metrics to monitor and evaluate the efficiency as well as benefits of eGovernment investments are lacking. Above all, a clear understanding of the value of eGovernment, and value for whom, is needed.

Key research questions:
- What frameworks, methods and metrics are needed to appropriately monitor, evaluate, and communicate the costs and benefits of ICT investments? Which tools are currently available and/or in development?
- What internal and external factors influence the value of eGovernment for different stakeholders?
- Whose and which values and indicators need to be assessed?
- How to ensure consideration of requirements and values of all stakeholders?
- Are methods such as value sensitive design (VSD) good enough to develop and support systems based on human values?

Keywords: ICT investment criteria, measurement frameworks, value of ICT in government

Table 25: *Roadmap for the research theme*
"Assessing the value of government ICT investment"

#	Description	Means	Actors	Timeline
1	Review existing research and practices in ICT value assessment, including studies of existing systems development methods and standards, with a focus on stakeholders and values. Furthermore, assess the added value for eGovernment. Review and analysis shall cover: The identification of all stakeholders and their requirements in government ICT investments The financial and human values The frameworks and methods for measuring and assessing ICT values The practical aspects of "soft" systems methods used by developers Business aspects and the governance responsibilities of the senior people in government and business	Desk research, literature reviews, surveys, questionnaires	Researchers and Consulting, with input from Governments, ICT industry	now -> 2010
2	Develop a measurement and assessment framework for government ICT investments, covering: All stakeholders Measures of human and financial values Development methods Governance practices Flexibility of the framework to be usefully applied in future eGovernment scenarios	Theory Design, Conceptual Design, Action research	Researchers, with input from consulting, ICT industry and government	2009 -> 2011
3	Test the measurement and assessment framework Develop operational and training documentation Develop evaluation criteria for the tests Select test sites Test the framework at selected sites	Pilot studies surveys questionnaires	Consulting and Research with involvement of government and ICT industry	2012 –> 2015
4	Evaluate the tests of the framework Evaluate results against the test criteria Refine the framework and training documentation	Analysis Evaluation research	Researchers	2014 –> 2016
5	Widely apply and promulgate the measurement and assessment framework for ICT investments to governments, ICT consulting and industry and other interested parties	Publications, Learning journeys, Seminars and workshops	ICT Consulting, supported by research	2014 –> 2020 and beyond

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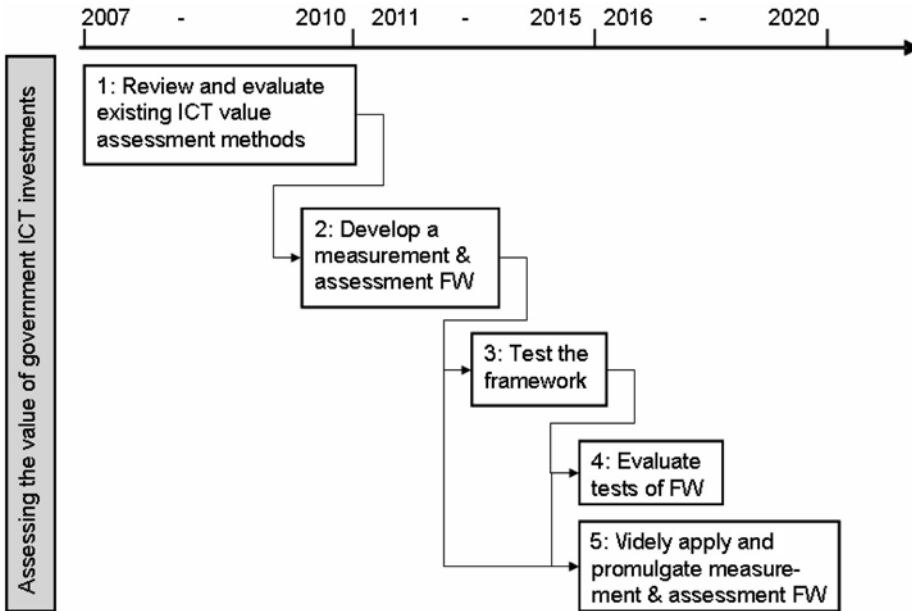
Figure 19: *Phased actions for the research theme*
"Assessing the value of government ICT investment"

6.2.5 eParticipation, citizen engagement and democratic processes

Abstract: In using ICT, elected officials and civil servants must remain open and accountable in their activities, behaviour, and decision-making. At the same time, government must ensure that those individuals and groups that wish to participate in democratic processes have the opportunity and means to do so.

Key research questions:
- What are the social and technical dimensions of participatory democracy, and what are the barriers of low citizen engagement?
- How might citizens be better informed and involved in governmental decision-making processes?
- How might the health of democratic discourse be measured? And might democratic models change with a wide spread of eParticipation?

Keywords: eParticipation, citizen engagement, participative policy processes

Table 26: *Roadmap for the research theme*
"eParticipation, citizen engagement and democratic processes"

#	Description	Means	Actors	Timeline
1	Analysis of the reasons for active / passive participation Identify the main factors that foster / distract from active participation in government decision-making Impact of political, economical and societal changes to attract citizens to participate in decision-making processes via ICT	Impact analysis, action research, case studies	Research with governments and consulting	now –> 2010
2	Analysis of ICT usage in the implementation and evaluation stages of policy making	Action research, case studies	Research with policy makers	2008 -> 2012
3	Identification of the most suitable tools for the respective eParticipation domains: Define the boundaries of effective eParticipation domains Assemble proper tool-kits for specific eParticipation domains suitable to provide most consistent, knowledgeable and usable eParticipation platforms Integrate and exploit knowledge management tools and techniques to support an effective analysis, processing and feedback provision of opinions and arguments	Action research, technology development, case studies, pilot projects	Research and key players from Governments, ICT industry and consulting	now -> 2012
4	Analysis of emerging changes in governance and political structures influenced by the spread of eParticipation How does eParticipation help to implement / enhance democratic principles? How does eEngagement change the relationships between citizens and their elected representatives? What impact does eParticipation have on political parties and on their roles in democracy models? Can eParticipation displace political parties? What new democracy models may emerge by a broad realisation of eParticipation?	Impact analysis, case studies, futures analysis	Research, trends analysts, politicians, policy-makers	2011 –> 2015
5	Development of an eParticipation public value measurement framework Map eParticipation tools with eParticipation areas and policy lifecycle processes Develop indicators to measure the public value of eParticipation and public engagement via ICT Assess the benefits and measuring the added value of participation via ICT Reflect the requirements of eParticipation tool-kits and how these can be implemented to contribute to public value creation Create awareness about the added value of public engagement via ICT	Action research, desk research, case studies, pilot projects	Research and key players from Governments, politics and civic society	2009 –> 2015
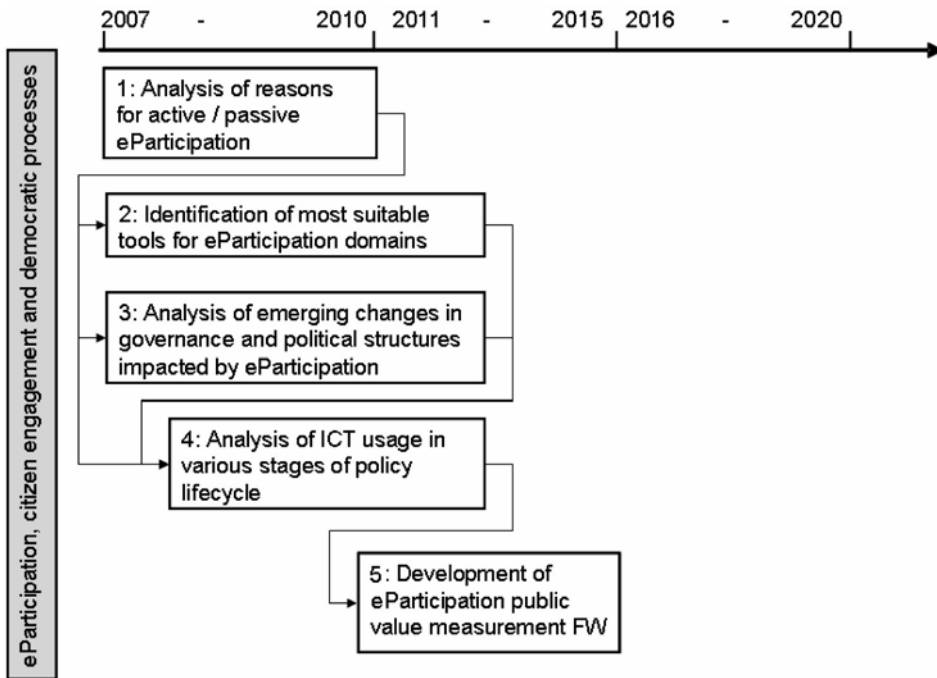
Figure 20: *Phased actions for the research theme*
"eParticipation, citizen engagement and democratic processes"

6.2.6 Mission-oriented goals and performance management

Abstract: Many eGovernment projects do not start with the primary missions of government in mind. Instead, they are often dominated by a technology-driven approach. This is similar to the situation in which a budget is structured and evaluated by the nature of expenses rather than by the public service goals that expenditures support. In both cases management attention is diverted away from the core mission.

Key research questions:
- How might a mission-oriented view of eGovernment change priorities, investments, practices, and assessment of results?
- What are the deficiencies of present monitoring and controlling methods used at the various levels of governments in respect to budget planning and spending? How to evaluate the obstacles and barriers of change, including constraints introduced by organisational cultures?
- Which organisational and procedural performance management changes are required to implement mission-oriented eGovernment lined up with a proper planning, spending and controlling management (such as reward systems, laws and regulations)?
- Which peculiarities do proper resource planning information systems have implement in order to meet the needs of a mission-oriented goals and performance management in the public sector?

Keywords: performance management, mission-centric public services, balanced scorecard

Table 27: *Roadmap for the research theme*
"Mission-oriented goals and performance management"

#	Description	Means	Actors	Timeline
1	Identify and analyse existing government goal and performance management initiatives at all levels of state in terms of: Origin of initiative and motivation Level of implementation Mission selected Information systems used, and their peculiarities	Action research, Surveys and Questionnaires, Desk research	Research, Consulting, Governments, Civil servants	2007 -> 2009
2	Develop a framework for mission-centric goals and performance management Definition of the missions of public services Measurement criteria for mission vs. performance mapping Cost analysis measurement metrics for public services Develop a proper monitoring and control cycle embodied in the framework	Action research, Conceptual design of questionnaires, survey design, mapping mechanisms	Research, Governments, Consulting	2008 -> 2011
3	Apply and refine the framework with selected test cases and test: Mission statement for public service (mission, services involved) Identification and development of a typology of public service missions Performance evaluation and assessment of coherence between means (equipment, human resources, etc.) and mission -> performance mapping and assessment Test the motivator concept and reflect lessons learnt	Pilot cases, Action research, Conceptual design, Surveys, Observations, Case analysis	Research, government, consulting -> strong stakeholder involvement	2009 -> 2015
4	System support for the implementation and application of the framework	Systems development	Research and ICT industry	2011 -> 2015
5	Capacity building Development of [online] learning resources, workshops and seminars on mission-centric goals and performance management in the public sector for different stakeholders (governments, politicians, consulting, etc.) Study and develop a motivator concept to provide incentives to civil servants towards realising an organisational culture of mission-oriented goals and performance management Development of a best practice repository for mission oriented goal and performance management Cooperation with organisations in charge of professional training of civil servants	Case studies, eLearning modules and text books for training and education, Workshops, Seminars, Learning journeys	Consulting, Academia involved in capacity building	2011 –> 2015
6	Transfer of goal and performance management framework Introduction of goal and performance management in international, national, regional, and local governments Investigate the diffusion of the innovation	Seminars, workshops, learning journeys, twinning cases	Consulting and research together with governments	2013 -> 2020
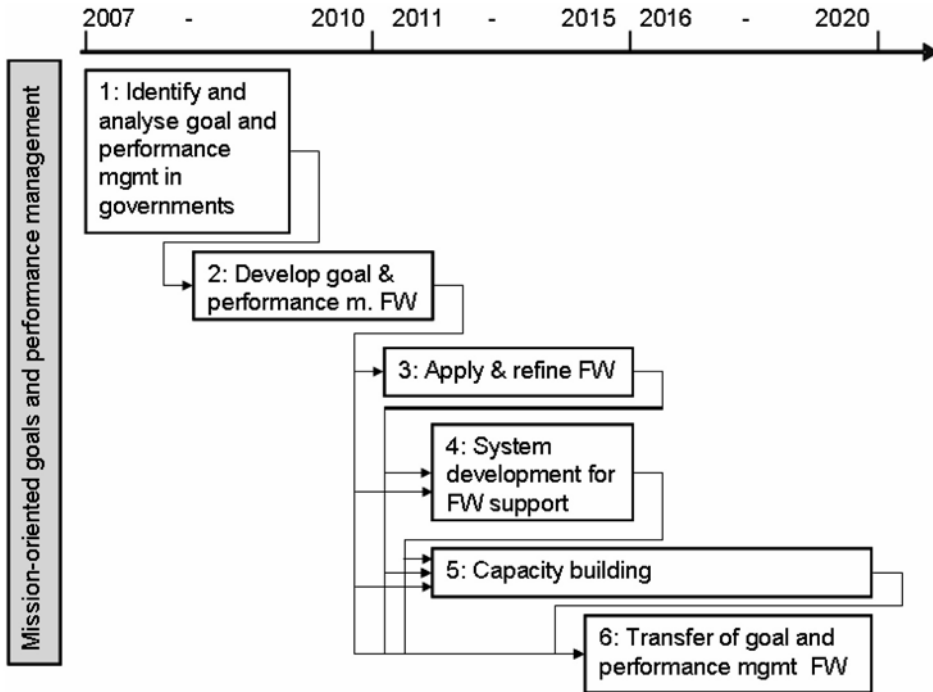
Figure 21: *Phased actions for the research theme*
"Mission-oriented goals and performance management"

6.2.7 Cyber infrastructures for eGovernment

Abstract: Future eGovernment technology platforms might consist of a reliable, ubiquitous infrastructure that supports systems and applications assembled out of readily-available, re-usable components. However, realisation of this possibility requires research in various domains including whether and how a building block-oriented ICT-industry could develop, and what types of architectures, building blocks, and standards are needed.

Key research questions:
- Which elements make up and which conditions need to be fulfilled to enable the establishment of a pan-European cyber infrastructures and building block industry and technology platform?
- What would be the main products and contributions of such a technology industry for eGovernment (standards, out-of-the-box modules, web services repository, etc.)? How (if at all!) can collaboration among all levels of government (horizontal and vertical collaboration) be facilitated and made interoperable in general with such a building blocks industry?
- Who should initiate such a building block infrastructure, which business models are feasible, and how to guarantee secure, reliable and reliable services for governments in a competitive market?
- What would be the conditions and incentives for creating a building block industry?

Keywords: infrastructures, building blocks, architectures, standards

***Table 28:** Roadmap for the research theme "Cyber infrastructure for eGovernment"*

#	Description	Means	Actors	Timeline

1	Investigate and analyse the essential elements of a cyber infrastructure and European building block industry
	
	    What are the main characteristics?
	
	    What elements will contribute to success and failure?
	
	    Landscape/ scope of understanding
	
	    General criteria to evaluate such an industry and determining the contribution to Europe
	
	    Determine feasibility by analysing commitment of industry partners
	
	    Evaluate benefits/costs of such an industry
		Desk research, interviews, technology platforms	ICT Industry, Consulting, Governments and Research	now, urgently needed -> 2008

2	Identify and develop feasible business models for a building blocks industry
	
	    Building blocks offered
	
	    Setup of a repository of building blocks (broker)
	
	    Sourcing of the building blocks
		Interviews, workshops, deploy a technology platform	ICT industry, Government and Research	now, urgently needed -> 2008

3	Develop and implement a repository / technology platform of eGovernment building blocks
	
	    Basic infrastructure of the technology platform and building block repository
	
	    Define a process and settle agreements of how to use a building block and how to contribute with an own component to the building block repository
	
	    Secure reliability, security, scalability etc. of the building blocks infrastructure and a flourishing business model contributing to the visions of global interoperable collaboration across organisations
		Technology platform, conceptual design, Project implementation	Industry, consulting, government and research	2009 -> 2011

4	Deploying the building blocks repository and contribute with services and building blocks
	
	    Agreements
	
	    Determine and add building blocks
	
	    Set up and clarify the maintenance procedures and liability issues
	
	    Develop standards for enabling an interoperable public sector accessible via the building blocks repository
	
	    Determine and evaluate impact of repository in terms of benefits, added value, business models, incentives to contribute with own developments, etc.
		Pilot project, Implementation and Deployment, Surveys and comparative analysis to identify new building blocks and new needs	Consulting, ICT Industry and Government with some support of research	2009 -> 2020

5	Continuous monitoring and evaluation of the business model and quality of building blocks to guarantee a successful technology platform running
	
	    Analyse and evaluate business models
	
	    Determine if new incentives are needed
	
	    Analyse and evaluate cyber infrastructure and determine extensions
		Impact analysis, case studies and cost-benefit analysis	Government and research	2010 -> 2020
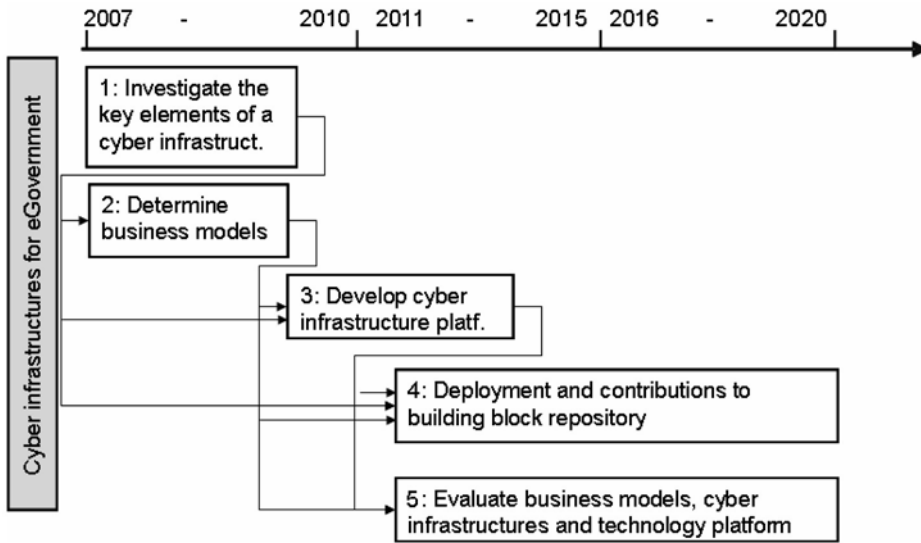
***Figure 22:** Phased actions for the research theme "Cyber infrastructure for eGovernment"*

6.2.8 Ontologies and intelligent information and knowledge management

Abstract: Governments are currently struggling with huge information overloads, with new and emerging ICT capabilities, and with a shortage of information management skills and human expertise. Ontologies and knowledge management facilities (such as search, retrieval, visualisation, text mining, and intelligent reasoning) seem promising be exploited to achieve information quality and economy, and to support knowledge management processes in eGovernment settings.

Key research questions:
- How can ontologies and knowledge management facilities (such as search, retrieval, visualisation, text mining, and intelligent reasoning) be exploited to achieve information quality and economy, and to support knowledge management processes in eGovernment settings?
- How to extract and retrieve information and valuable knowledge, as well as mining data and text from unstructured and dispersed knowledge bases and information sources?
- How to visualise knowledge and create cognitive knowledge models accessible for all, as well as intelligent interfaces for all?
- How to build a foundation of common reference models (ontology) for eGovernment and eParticipation?
- How do advanced information and knowledge management tools and concepts in eGovernment impact governments, market and society as well as information quality and information economy in respect to government activity?

Keywords: Information and knowledge management, intelligent reasoning, ontologies

Table 29: *Roadmap for the research theme*
"Ontologies and intelligent information and knowledge management (KM)"

#	Description	Means	Actors	Timeline
1	Studies to investigate a proper understanding of ontology and knowledge management (OKM) in government contexts, including: Which stakeholders need which kind of knowledge in which contexts? Which solutions are already in use? What barriers do hinder proper knowledge management introduction in government contexts? What are the benefits of knowledge management in the various eGovernment contexts, and for whom? What tools are needed for effective knowledge management in government settings? Taxonomy / ontology of eGovernment knowledge Landscape / scope of understanding Criteria to assess the value of knowledge Drivers to introduce knowledge management in eGovernment contexts	Action research, comparative analysis, desk research, conceptual design, theory development	Research with key players from governments and ICT industry	now -> urgently needed - 2008
2	Measuring existing approaches of knowledge management and testing them in government settings in respect to the key aspects and added value of KM and ontology	Gap analysis, action research, pilot projects	Research with key players from governments and ICT industry	now -> urgently needed - 2009
3	Develop a framework for measuring the added value of KM and ontologies and impact on information quality and economy, as well as on efficiency and effectiveness of government activity as such Criteria Make objectives/ criteria operational	Conceptual design and user participation, action research	Research (and consulting) with involvement of governments (and customer representatives)	2008 –> 2010
4	Apply, evaluate and improve the framework Pilot cases Reengineering of framework Benchmarking at micro-level Benchmarking across countries (macro-level)	Pilot projects, reengineering the conceptual design, benchmarks	Consulting and key players of governments, with some support of research	2010 –> 2015
5	Analysis of costs and benefits of KM and ontology usage What are the costs if no such instruments are introduced? What are the benefits of such instruments? What investments are needed for good ontology and KM exploitation? What are the consequences of good or of bad ontology and knowledge management in government decision-making and electronic public services contexts?	Desk research, comparative analysis, impact analysis, action research, case studies	Research and consulting with key players from governments and ICT industry	2010 -> 2020

6	Develop a proper ontology for eGovernment and eDemocracy	Conceptual design, participatory design, action research	Research, governments, ICT industry, and consulting	now -> 2010
7	Development of knowledge management tools and processes to be integrated in government activity	Requirements analysis, conceptual design	ICT industry and research with involvement of key players from governments	2009 -> 2012
8	Piloting knowledge management solutions in eGovernment settings	Pilots, Case studies	ICT industry, consulting, governments, and research	2010 -> 2020
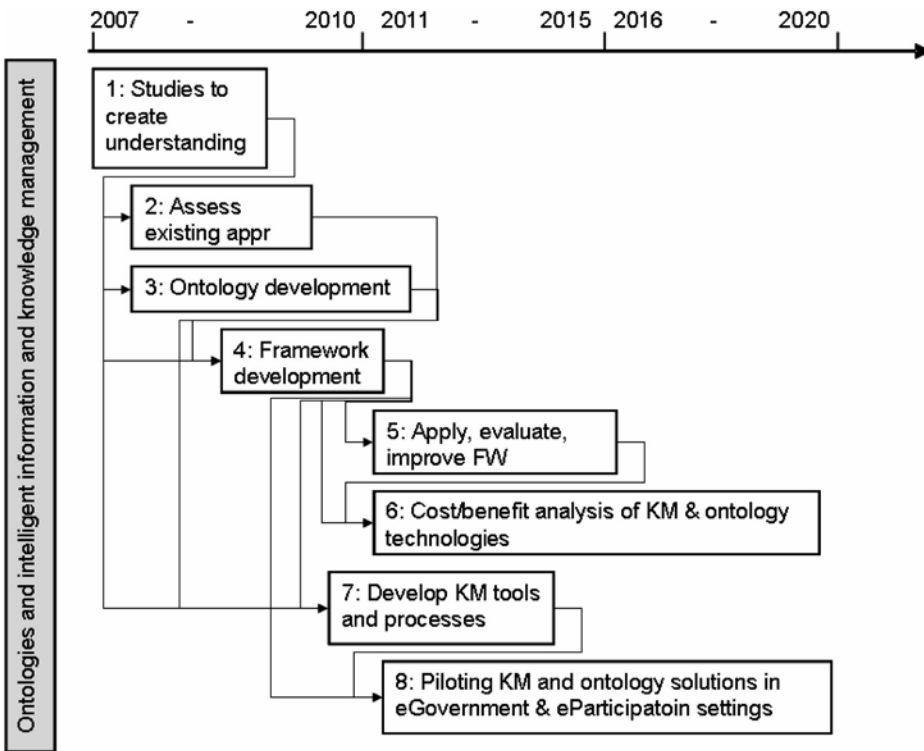
Figure 23: *Phased actions for the research theme*
"Ontologies and intelligent information and knowledge management (KM)"

6.2.9 Governance of public-private-civic sector relationships

Abstract: Increasingly, governmental functions and public services incorporate significant roles for private sector or civic organisations. These roles play out in a variety of relationships from advisory, to collaborative, to contractual, to full partnerships. Adequate principles and frameworks are lacking, which facilitate and set the ground of collaboration in

advancing and deploying eGovernment in regards to sharing responsibilities and exchanging information among networks of diverse organisations in ways that generate public value and satisfy public requirements for fairness, accountability, and competence.

Key research questions:
- What principles and frameworks are needed for sharing responsibilities and exchanging information among networks of diverse organisations in ways that generate public value in the eGovernment offers and that satisfy public requirements for fairness, accountability, and competence?
- Which State functions and tasks should be performed only by governments?
- How to develop a legal framework and effective governance structures for cross-sector arrangements? And what policies and strategies are needed for ensuring integration and accountability of public services provided by organisations other than public bodes underlying strict legal obligations?

Keywords: inter-sectoral relations, network governance, partnerships

Table 30: *Roadmap for the research theme*
"Governance of public-private-civic sector relationships"

#	Description	Means	Actors	Timeline
1	Review and synthesise existing research on cross-sectoral relationships according to their relation to governmental functions and public services What kinds of functions and services benefit from such relationships? Which are not suitable? What types of relationships are already in practice? How is performance measured and legal compliance reached? Developing frameworks, ontology/ taxonomy/ typology	Desk research, literature reviews	Research	now –urgently needed -> 2008
2	Assess existing approaches Identify existing cross-sectoral initiatives What are the desirable outcomes? What are the incentives and disincentives for each kind of stakeholder? Legal compliance issues? Apply performance evaluation techniques How well do these initiatives work? What is missing? What are the points of failure? What are the key characteristics of successful initiatives, what are the critical success factors?	Comparative analyses, action research, gap analysis, evaluation research	Research with key players from Government, Consulting and ICT industry	now -> 2010
3	Develop a framework for initiating, operating, and assessing cross-sectoral initiatives Define variables Identify dynamic relationships among variables Make the framework operational	Conceptual design	Research	2009 –> 2011

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4	Test the framework
	
	  Select pilot cases
	
	  Prototype the framework
	  Evaluate the results (in terms of costs, benefits, incentives, disincentives, performance, legal compliance, and public value)
	  Refine the framework
	
	  Develop practical guidelines
		Pilot projects, prototypes, evaluation research	Research, Consulting and key players from Government	2012 –> 2015

5	Apply and evaluate the refined framework in the operational settings
	
	  Re-evaluate
	
	  Refine practical guidelines
	
	  Refine theoretical foundations
		Desk research, comparative analysis, Impact analysis, action research, case studies	Research and Consulting with key players from Government and ICT industry	2015 -> 2020

6	Develop executive and academic education material based on results
	
	  Selection criteria
	
	  Stakeholder concerns and relationships
	
	  Incentives and disincentives
	
	  Dynamics of relationships and activities
		Action research, programme development	Research and Consulting with key players from Government and ICT industry	now -> 2020
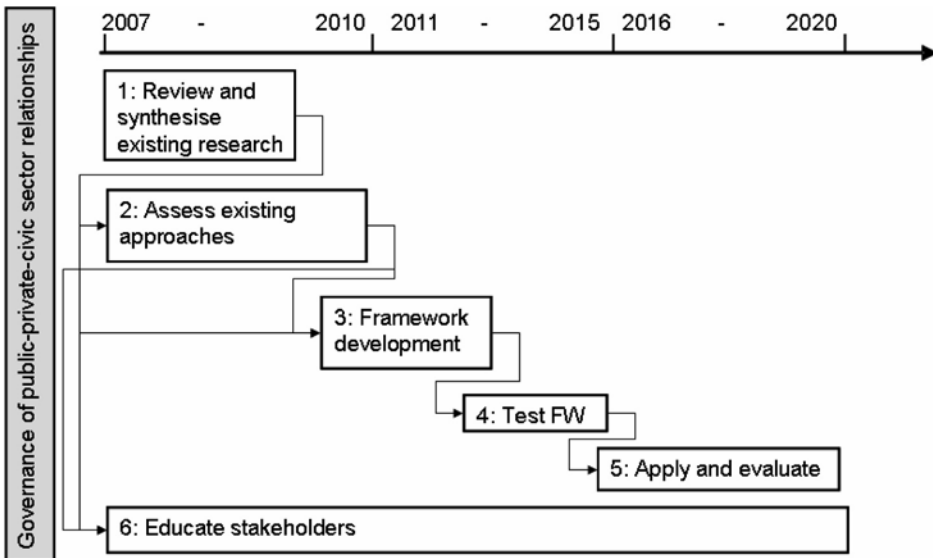
Figure 24: *Phased actions for the research theme*
"Governance of public-private-civic sector relationships"

6.2.10 Government's role in the virtual world

Abstract: Global electronic markets, virtual organisations, virtual identities, virtual products and services, and Internet-related crime are growing in prominence and importance. In a world that is increasingly non-physical and borderless, government's roles, responsibilities and limitations are subject to change and are blurring.

Key research questions:
- What are government's roles, responsibilities and limitations in a world that is increasingly non-physical and borderless?
- Is a different legislation needed for the cyberspace? What is needed if national laws are to be translated into the Internet, e.g. to generate virtual national borders or to set up global international legal framework? If new international laws are needed, who will define and who will implement the laws?
- Who will keep the legislators of international cyber laws under surveillance? Who could be in possession of the sovereign power? What will happen if only a few governments undertake efforts to strongly regulate the Internet?
- What kind of virtual citizenship will appear?

Key words: intellectual property, government in cyberspace, regulating the virtual world

Table 31: Roadmap for the research theme "Government's role in the virtual world"

#	Description	Means	Actors	Timeline
1	Studies to investigate a proper understanding of the nature of the Internet and where these characteristics challenge Governments to intervene in terms of action, reaction, prevention, and legislation, including the mapping of activities and actors Identify current challenging trends in the Internet that require government action, intervention and regulation in order to prevent e.g. crimes Identify currently existing Internet activity surveillance and crime prevention detection mechanisms Linking trends with activities and actors, and assess the specific aspects that require government interaction (Privacy, data access, Intellectual property rights (IPR), criminal actions)	Risk and trend analysis, desk research, SWOT analyses, surveys, comparative studies, establishment of international expert groups	Research with key players from Governments, Politics and civic sector representatives	2007 -> 2009
2	Perform futures analysis on the basis of critical trends and evolutions identified, with specific focus on: Risks of cyber crime, cyber terrorism, spamming, spoofing, manipulation of the virtual world code of conduct, etc. Usage of the Internet as a crucial platform of communication in cases of catastrophes and near-misses What are the potential dangers and opportunities of Internet, where government needs to clearly regulate the way and means as well as priorities of action in such scenarios	SWOT analysis, Scenario building, Trend analysis, risk analysis, analysis of critical interdependencies and hazardous situations	Researchers, legal experts, Governments and ICT industry	2008 –> 2010

3	Develop mechanisms and framework in order to monitor activities and trends in the virtual world; and to assess these activities and changes in terms of how far governments will be required to regulate imbalanced Internet activities of stakeholders	Change analysis, Trend analysis, surveillance and monitoring conceptual design, Internet laws development	Research with key players from governments and consulting	2008 -> 2012
4	Put needs of regulations, mechanisms and framework into action and implementation How to properly adapt and enlarge a legal framework for eCrime Mechanisms and tools for crime prevention and prosecution with regard to balance freedom and security How to create sustainability in the Internet? Examples of virtual regulation areas: taxation; IPR, customs; trade; information sharing, data privacy, violence; cyber crimes; education, eHealth issues, virtual citizenship, etc. How to switch Governments from pursuit mode into proactive mode?	Legal drafting and implementation, reengineering of national laws, pilot projects; European directives	Governments, with support from research and consulting	2010 -> 2020
5	Training and education to prepare and empower people to handle the virtual world and make them aware of the challenges and implications of using the Internet Introduction of awareness and education in primary schools and continuing till higher education Concepts for life-long learning, especially for newcomers in the Internet area and parents which enable their kids unsupervised and unmonitored Internet access	Curricula updates, development of training and education modules, Seminars and workshops for new Internet users, pilot projects	Research and education, Government, Consulting	2010 -> 2020
6	Implementation and monitoring of impact of regulations and training	EU directives	Governments, Consulting, ICT Industry, Academia, Civic Society and NGO organisations	2010 -> 2020
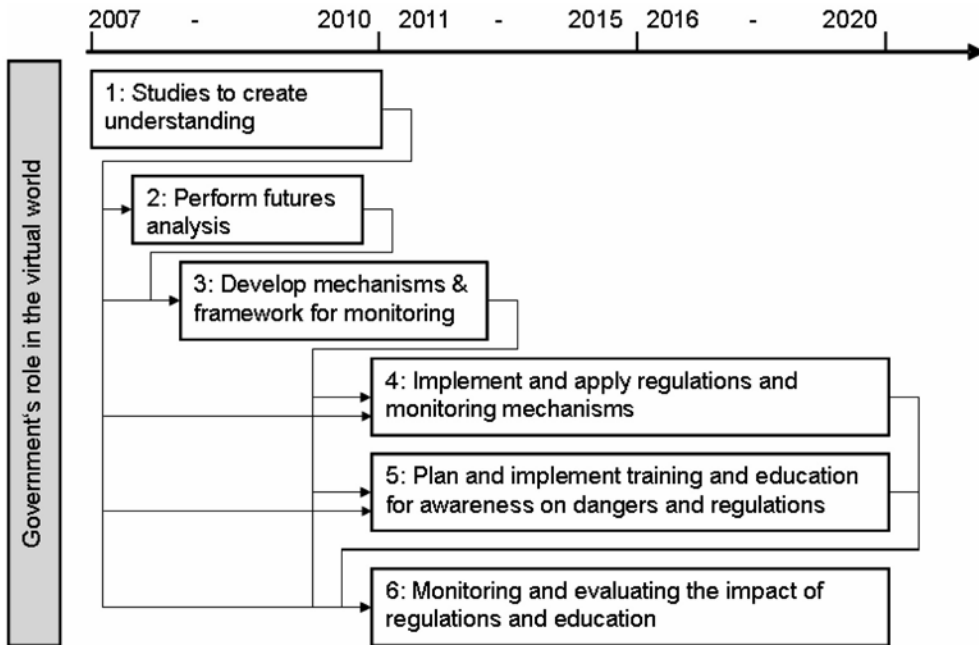
Figure 25: *Phased actions for the research theme "Government's role in the virtual world"*

6.2.11 Crossing borders and the need for governance capabilities

Abstract: The scope of problems and trends that governments need to cope with vary widely in size, intensity, and complexity. Social networks, gender issues, environmental concerns, political movements, etc. reach beyond local, regional or national borders. It is unclear, how these phenomena can be steered and governed properly across organisational boundaries, especially through exploiting capabilities available in neighbourhood regions and contexts.

Key research questions:
- How can government support communication, action and services across traditional borders?
- What governance networks are needed in such diverse cultural / technical / political contexts within a large European Union with its rich societal diversity and internal market?
- How to steer governance networks properly? And what technical support will be needed to steer governance networks?
- Which kinds of human capabilities will be needed?

Key words: cross-border issues, networks, governance capabilities

Table 32: *Roadmap for the research theme*
"Crossing borders and the need for governance capabilities"

| #	Description	Means	Actors	Timeline
1	Studies to investigate a proper understanding of the needs and capabilities for cross-border governance in eGovernment contexts What is at stake? Evaluating existing research Landscape/ scope of understanding Which kinds of capabilities are needed? What are the core elements of governance networks crossing borders? What does technology offer to support and enrich governance capabilities? Linking to activities / actors	Action research, comparative analysis, desk research	Research with key players from governments, consulting and ICT industry	now -> urgently needed - 2009
2	Develop, validate and test a framework for measuring cross-border governance capability Criteria Make objectives operational	Conceptual design and user participation, pilot projects, evaluation studies	Research, consulting, governments, ICT industry	2009 –> 2013
3	Apply the framework in wider scope Implementation cases Reengineering of framework Benchmarking at micro-level (within a regional context) Benchmarking across countries (macro-level) Transfer experiences and solutions	Implementation projects, reengineering the conceptual design, benchmarks	Consulting and key players of Governments, with some support of research	2013 –> 2020
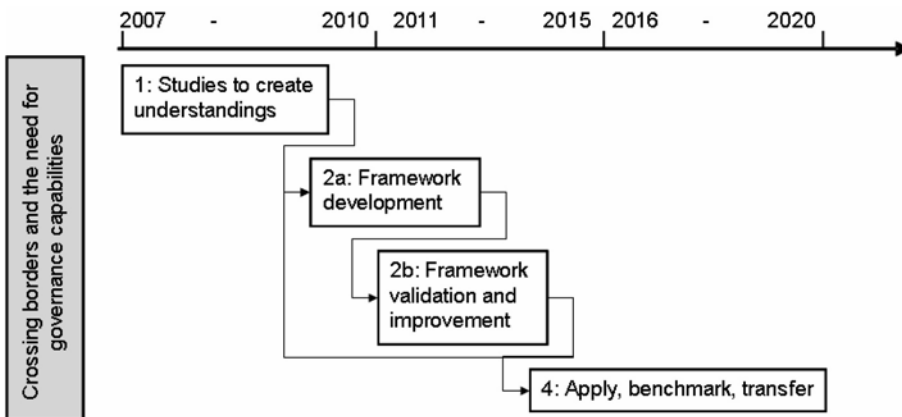
Figure 26: *Phased actions for the research theme*
"Crossing borders and the need for governance capabilities"

6.2.12 eGovernment in the context of socio-demographic change

Abstract: Demographic trends with global consequences (such as age distribution, wealth distribution, immigration, and mobility and distribution of workers) are generating pressing issues in both developed and developing countries. Within the European Union, facilitating mobility of citizens and trade across the whole internal European market are strategic aims to foster. These strategic goals as well as the demographic movements and changes require the public sector at the various administrative and political levels to act and react with according public service offers.

Key research questions:
- What opportunities and risks do these demographic movements imply for governments at the various administrative and political levels?
- What ICT and eGovernment services will be needed in such an environment?
- How to streamline fast adoption of the current public administration systems like taxation, social security, healthcare, etc. to a European model which meets the current needs of the demographic change?
- What technology solutions can help empower elderly people to stay connected with the world of cyberspace, and to benefit from enhanced services targeted towards elderly?
- What role does government have in managing the evolving competition for human resources among regions / nations and in ensuring an even development across regions and countries (including the aspect of government service quality as a competitive [dis]advantage factor)?
- How to ensure the successful integration of immigrants to the society of their chosen environment?
- What government services (and specific technology support) are needed to cope with new challenges due to climate change and other events mentioned in the scenarios.

Key words: demographic change, ageing, geographic mobility

Table 33: *Roadmap for the research theme*
"eGovernment in the context of socio-demographic change"

#	Description	Means	Actors	Timeline
1	Analysis of issues diverging across countries in the EU Member States to understand regional differences and to elicit the needs for harmonisation and cross-border interoperability to allow wide mobility of society and market. Examples of diverging procedures are: taxation, social security, healthcare and similar systems (education, jurisdiction, etc.)	Desk research, comparative studies, surveys	Research	now -> 2009
2	Development of a standard formal methodology to measure the socio-demographic differences in different countries and the impact on integration and cultural interoperability	Desk research, conceptualisation, impact analysis	Research, government and politicians	2008 –> 2012
3	Development of ICT to support the methodology to measure socio-demographic differences and impact on integration and cultural interoperability	Pilot projects	Research, and ICT industry	2010 –> 2012

|				
4	Application of the measurement instrument (formal methodology supported with ICT system) in distinct areas of demographic change: Investigation of the impact of movements and change in different areas such as ageing, immigration, emigration, shortage of resources, climate, etc. Investigation of mechanisms to compensate migration Investigate a proper understanding of the social integration policies in the different countries, especially when new Member States enter the EU Which new ICT could empower certain fringe groups, which are potentially threatened through increasing digital divide to continue contributing to society? Which barriers need to be overcome thereby - technical, physical, financial, age, gender, family, social groups, level of literacy and skills, language, etc.?	Desk research, impact analysis, action research	Research and government, support from consulting	2009 –> 2020, continuously needed
5	Development of proper support toolsets to foster specific challenges accompanying demographic change (strategies, methods, legislation, technical instruments, educational material), and to identify implications and requests for action embodied in upcoming demographic changes	Conceptualisation, action research, pilot projects	Research, governments, consulting, ICT Industry	2010 –> 2015
6	Apply and test support toolset	Pilot projects	Governments, consulting, ICT Industry	2014 –> 2020
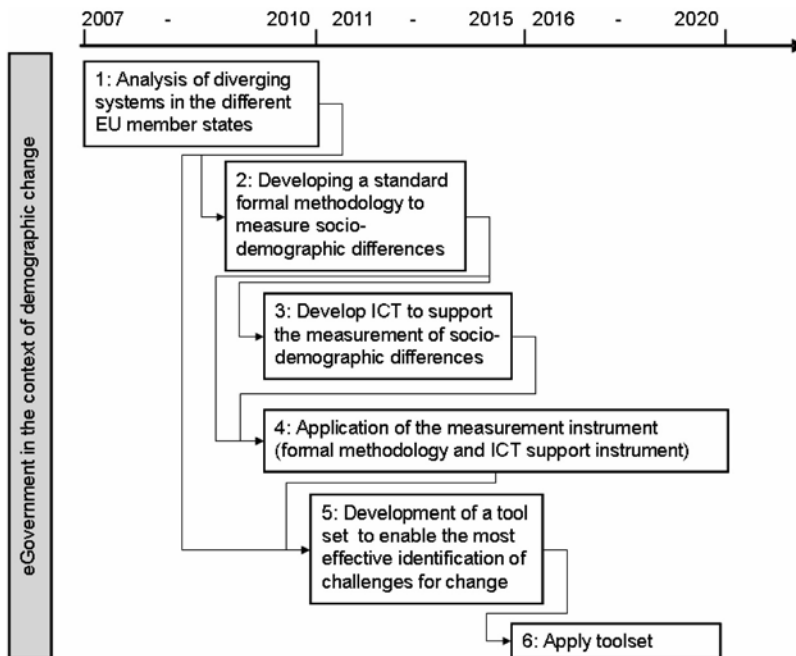
Figure 27: *Phased actions for the research theme*
"eGovernment in the context of socio- demographic change"

6.2.13 Data privacy and personal identity

Abstract: Data privacy and personal identity have become important aspects in the Information Society. On the one hand, the potential of modern ICT could be exploited to take advantage of personal information to improve the performance and quality of government services. On the other hand, privacy and personal data need to be secured and protected in order to prevent misuse and fraud.

Key research questions:
- What are the potential dangers and detailed characteristics for data misuse in a virtual world?
- What policies, protocols, and data management mechanisms are needed to balance individual privacy protection with effective and efficient use of that information by government?
- And what technical means are required to assure that privacy and personal data are secured and protected, and will not be misused?
- How does eGovernment technology affect identity, self-reflection, self-awareness, and trust? And how much privacy are citizens willing to loose in order to get sophisticated government services?
- Is an implanted chip an unwanted future scenario, where preventive measures need to be taken now to streamline evolution in another direction? If so, which direction?

Key words: data privacy, identity management, efficiency of services

Table 34: Roadmap for the research theme "Data privacy and personal identity"

#	Description	Means	Actors	Timeline
1	Studies to better understand the interferences of data privacy and risks of eGovernment service offers in respect to data privacy, as well as to investigate the balance between governmental service sophistication, modern ICT usage and data privacy: What are the potential dangers and detailed characteristics of risks for data misuse in eGovernment? How does eGovernment technology affect identity, self-reflection, self-awareness, and trust? Overview of different cultural feelings about privacy: How is privacy defined within a specific culture and what are the perspectives towards privacy within each culture? How much privacy are individuals and organisations willing to loose in order to get sophisticated eGovernment services?	Action research, comparative analysis, desk research	Consulting, governments, Research	now -> 2010
2	Develop a framework of trust - data privacy - ICT solutions - culture relationships including proper assessment metrics and audit rules	Desk research, literature review, Gap analysis, conceptual design	Governments, research and consulting	2008 -> 2010

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3	Apply the framework and audit rules for the data gathering and usage (implementation process)
	
	    Pilot cases
	
	    Reengineering of framework
		Pilot projects, Case evaluation, Reengineering the conceptual design	Governments, consulting, research	2010 – 2015

4	Create a legal basis for the processing and using of stored personal information	Legislation	Governments	2009 -> 2011
5	Development of privacy enhancing technologies; and include privacy and data protection factors as key elements in design lifecycles for eGovernment systems	Conceptual design, systems Engineering	Governments, ICT industry, research	now -> 2020
6	Development of training and education material, guidelines for investigating trust and data privacy in systems engineering, and offer courses in graduate education as well as in specific seminars for eGovernment systems developers	Training and education for target groups: governments, ICT industry, consulting	Research, consulting, professional training offers	2008 -> 2020
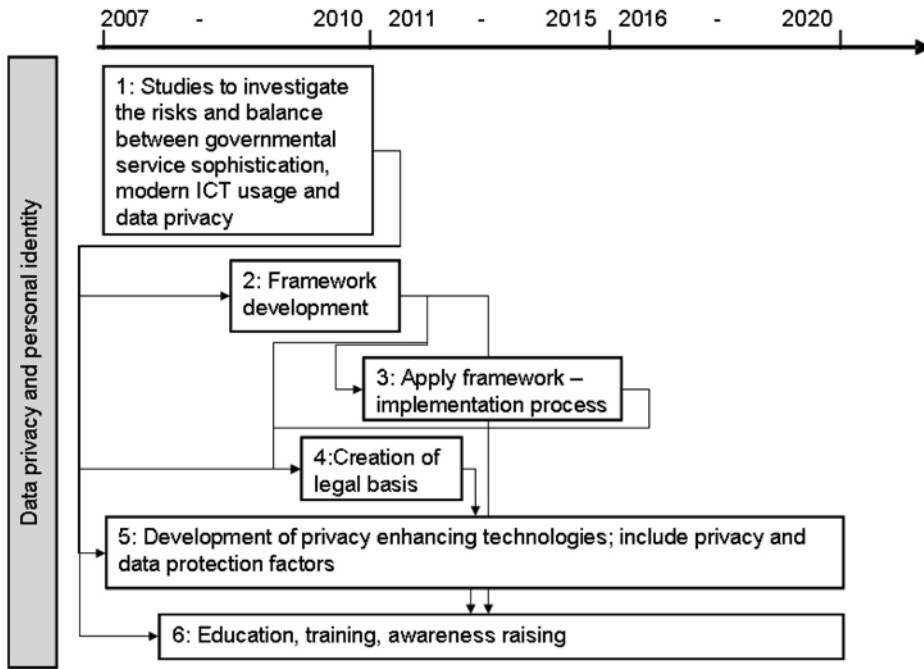
Figure 28: *Phased actions for the research theme "Data privacy and personal identity"*

6.3 Reflecting the synthesis process of the roadmap themes
Author: *Maria A. Wimmer*

The list of thirteen research themes presented here was gathered in several rounds of analysis and expert consultation. First, single regional workshops have been conducted, which resulted in a wide range of diverging research themes and trends. Then, the project members synthesised the results, grouped and merged similar themes, and eliminated

redundancies. Furthermore, the research themes mostly linked to the gap storylines were condensed. This resulted in eight main research themes.

In a European-wide consultation workshop in the beginning of January 2007 (held in Brussels[44]), a number of eight research themes[45] has been exposed to the assessment and discussion of experts. During this consultation workshop the eight research themes were extended to thirteen research themes presented before. The final versions of the thirteen research themes were compiled in a second round of synthesis with the project partners – based on the expert consultation workshop in Brussels.

These thirteen research themes have then been exposed again to a wide range of experts via an online consultation, with the aim to assess the importance of each single research theme. The results of this online survey are reported in the next section.

The thirteen research themes interrelate with on another, i.e. many aspects are inextricably linked. This is not surprising as these interdependencies and mutually inclusive aspects were already identified in the gap analysis (cf. chapter 5).
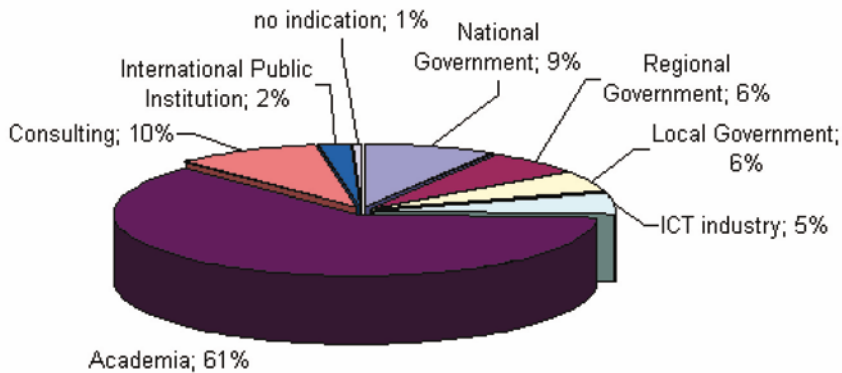
Figure 29: *Categories of participants in the online consultation (N=380)*

6.4 Results from the online survey on the importance of the research themes
Author: *Maria A. Wimmer*

In a final online consultation round, experts from all over the world have been invited to assess the thirteen research themes in terms of their perceived importance for future eGovernment developments. The survey started in mid February 2007 and was completed by the end of March 2007. In total 380 experts assessed the importance of each single research theme based on their expertise. Figure 29 shows the fine-granular distribution

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44. Details on the number of participants are provided in Table 21.
45. The themes were: Semantic and cultural interoperability; crossing borders and the need for governance capabilities; data privacy in eGovernment service provision; fostering trust in eGovernment; governance of public-private-civic sector relationships; Government's role in the virtual world; information quality in decision making; assessing the value of IT in government.

of experts. In absolute numbers 88 experts from governments, 57 from ICT industry and consulting, and 233 from academia participated.

Even though two thirds of participants came from academia, the number of experts from governments and ICT industry and consulting (145 in total) demonstrates a big interest and concern in the eGovernment roadmapping results.
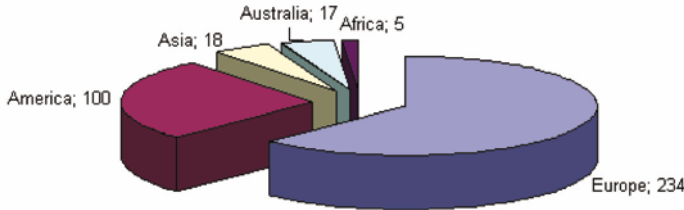
Figure 30: *Distribution of partecipants per continent (N=380)*

The majority of experts participating in the online survey came from Europe (from EU Member States: 205; non-EU Member States: 29). The other participants came from America (North: 87; South: 13), Asia (18, thereof 4 from Near East), Australia and New Zealand (17), and Africa (5). Although the majority of project partners as well as the eGov-RTD2020 roadmapping workshops had a focus on Europe, one third of the participants in the online survey came from outside Europe (see Figure 30). From this point of view the two international partners as well as the European partners performed well in reaching
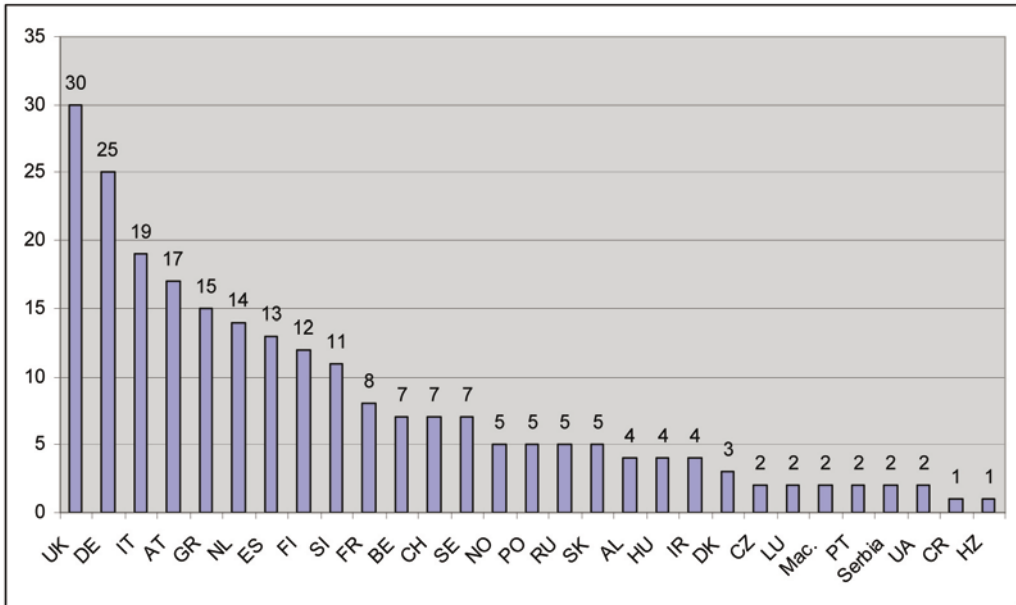
Figure 31: *Geographical spread of participants from Europe (N=234)*

a large community of international experts in eGovernment research and implementation. This large outreach may indicate a common and high international interest in future research needs of eGovernment.

Figure 31 further details the geographical spread of the participants from European countries in the online forum. Participants from 20 EU Member States (thereof 5 countries from the New Member States) and from 9 non-EU Member State countries assessed the importance of each of the thirteen research themes.

There is a clear concentration on experts from Western EU Member States. In particular the high number of participants from the United Kingdom (UK) is striking, as no project partner and no eGovRTD2020 workshop for both scenario building and roadmapping took part there.

Figure 32 shows the results of the online survey. The scale of assessing the importance of a research theme ranged from *1 = not important* to *6 = very important*.

The thirteen research themes have been assessed in a rather small range of 3,24 to 4,17 overall. This rather similar ranking is due to the fact that experts from different countries and from different stakeholder groups assessed the themes differently, hence, resulting overall in a medium ranking of all themes. A more detailed comparison of the assessments grouped by stakeholders and countries was performed. A synthesis is provided further on.
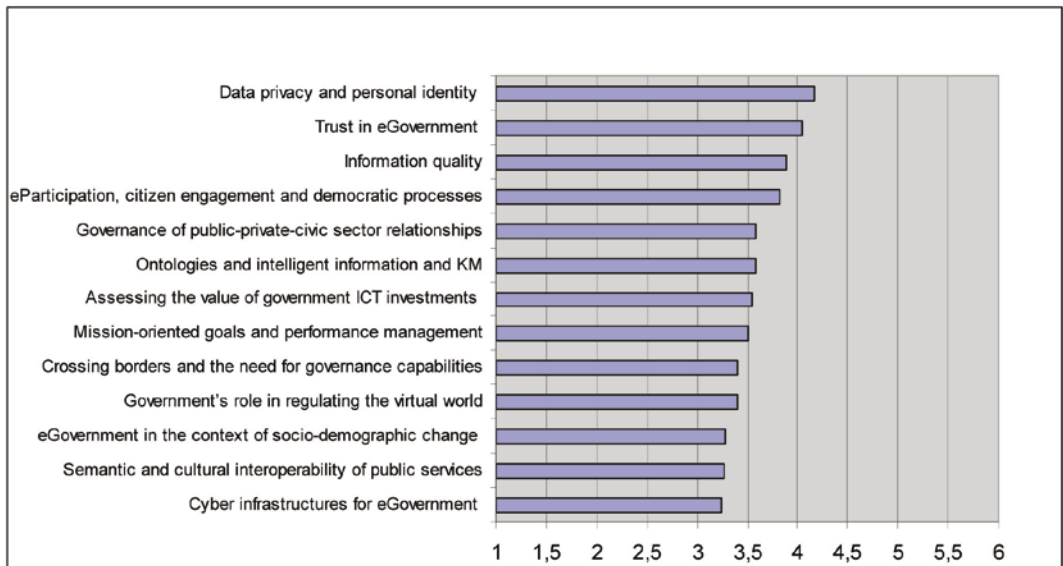
Figure 32: *Assessing the importance of research themes for future eGovernment – overall ranking (N = 380, range of assessment scale: 1 = not important, 6 = very important)*

The themes assessed by the experts as being the most important are *Data privacy and personal identity (importance score = 4,17)*, and *Trust in eGovernment (score = 4,05)*. Why did these two themes outperform the others? It could be argued that this is due to the fact that both themes are strongly related to concerns of eGovernment service consumption, transparency of data and how well technology can protect from data misuse and fraud. It

can also be argued that both aspects are already extensively reflected in earlier results: Trust was one of the three key dimensions of the scenarios (cf. chapter 4) and it emerged in different forms in a number of gap storylines (see chapter 5).

The theme ranked third is *Information quality* (score = 3,89). This theme is ranked nearly equal with *eParticipation, citizen engagement and democratic processes* (importance score = 3,82). Information quality has been mentioned several times in the gap analysis. Discussions in the roadmapping workshops brought up arguments that government service quality and effectiveness become more and more dependent on the quality of data and information available. The theme is not yet researched actively in the context of eGovernment. Consequently, participants may have a need of better understanding the theme and its implications to government activity based on ICT. The theme *eParticipation, citizen engagement and democratic processes* is already being investigated. Yet, experts may perceive current research and implementation as not mature enough, while the scenarios depict rather extreme visions of either no participation at all (scenario Individualised society – cf. section 4.5.2) or much more active participation (scenario Ambient government - cf. section 4.5.3) thereby exploiting the facilities of ICT.

Four themes have been ranked around the mean value of 3,5: *Governance of public-private-civic sector relationships*, *Ontologies and intelligent information and knowledge*
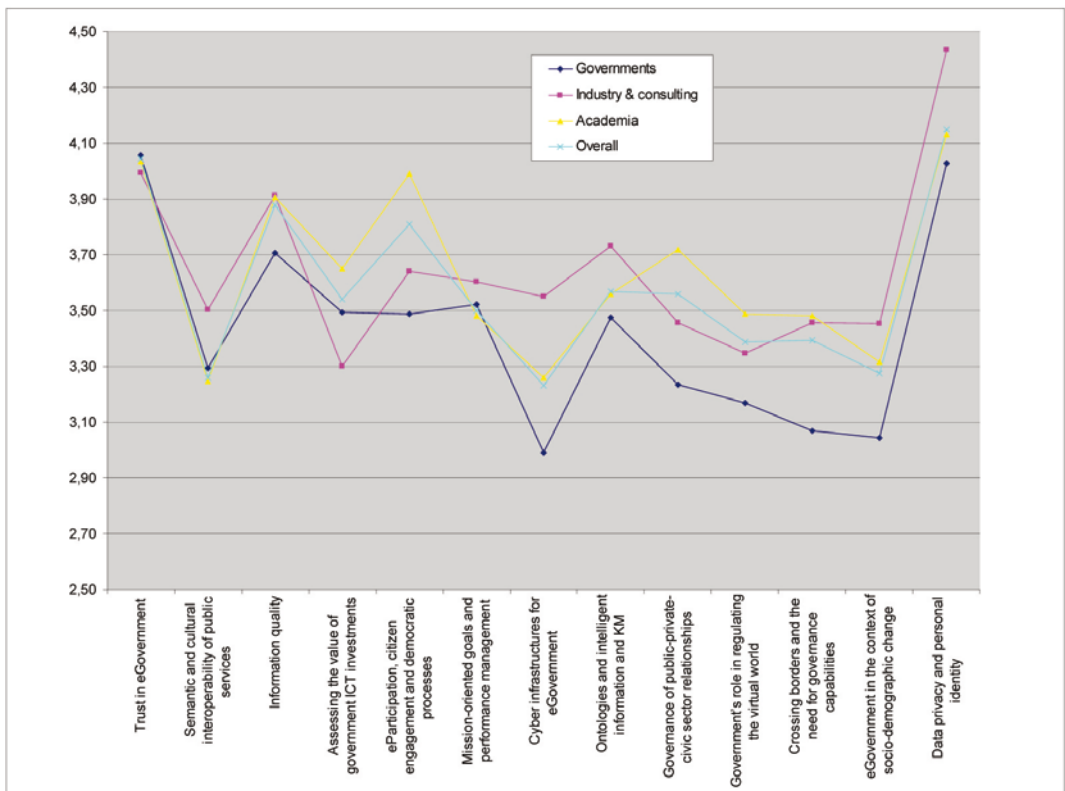
Figure 33: *Assessment of the research themes grouped by the general experts groups: Governments (N=88), ICT Industry and Consulting (N=57), and Academia (233) (2 experts did not indicate their professional background)*

management, *Assessing the value of Government ICT investments*, and *Mission-oriented goals and performance management.*

The other six themes have been ranked below the mean of 3,5, the theme *Cyber infra-structures for eGovernment* thereby scored lowest with 3,24.

In the following charts, we present a more detailed analysis of assessment, differenti-ated on the one hand along the experts groups, and on the other hand along the coun-tries and continents. Figure 33 reflects the assessments by the various expert groups. Academia and ICT industry and consulting in most cases ranked research themes higher than experts from government. Most significant differences can be recognised in the assessments of the themes Cyber infrastructures for eGovernment, which was ranked highest by ICT industry and consulting, while government experts ranked it lowest over-all. This might be due to the nature of the work and interests of the participants. Other no-ticeable differences exist in the assessment of themes Crossing borders and the need for governance capabilities, and eGovernment in the context of socio-demographic change. This might be grounded in the observation that representatives of governments still focus mostly on their country or institutional scope of activity, while neglecting developments taking place beyond their geographical borders.

Figure 34 gives an overview of perceived importance assessment by experts from dis-tinct levels of governments (N=88, where National Government: 34; Regional Government: 24; Local Government: 21; International Pubic Institutions: 9). This figure shows that in
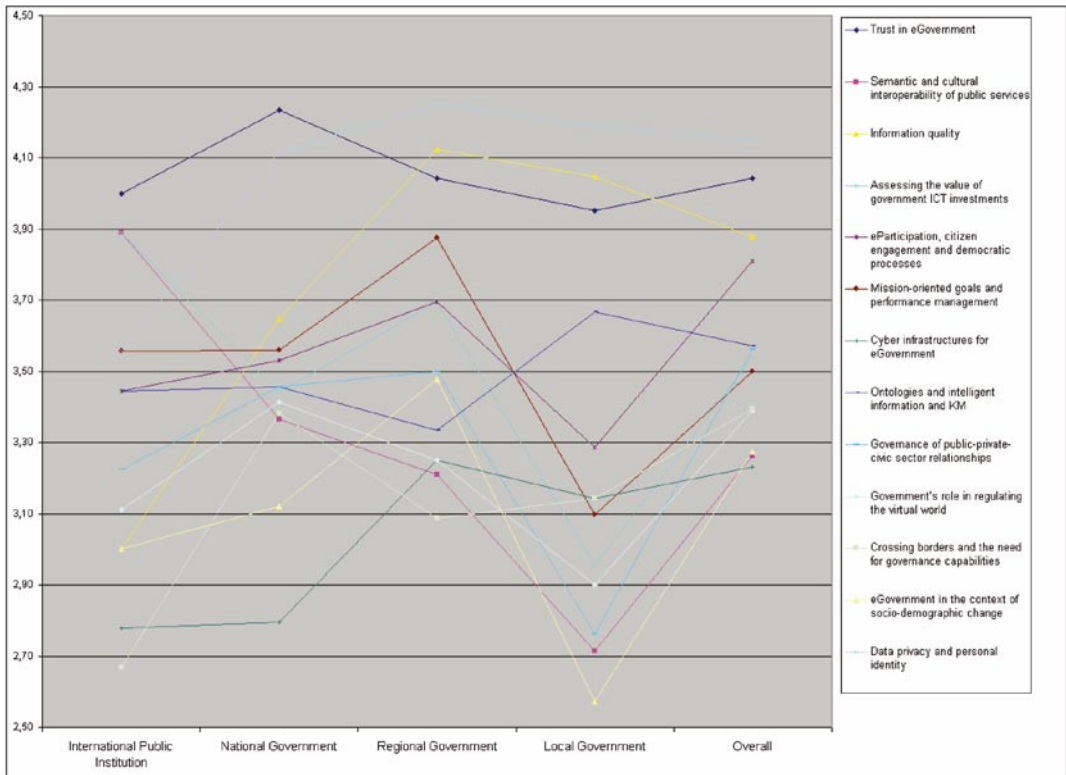
Figure 34: *Assessment of the research themes by Government experts (N=88)*

most research themes, the experts coming from the various levels of government have a different perception of importance on a theme. For example, local governments do rate the importance of eGovernment in the context of socio-demographic change with a score of 3,29, while regional Government experts rank it with a score of 3,7. This might not come as a surprise as different layers of government have different concerns.

Two other interesting phenomena are on the one hand that regional and local government experts perceived *Information quality* as rather important (score is around 4, and is higher than the overall value), while the experts from international public administrations did rate this much lower (around 3). On the other hand, semantic and cultural interoperability of public services is rated high by International public sector experts (score = 3,9), while the local level experts assessed it with a score of approx. 2,7. In general, Figure 34 shows diverging perceptions of importance of certain research themes among the government experts.

The variances of assessment by country groups were also analysed. Figure 35 shows the overall assessment of research themes grouped by experts in different countries. The mean scores of experts from America and Europe mostly map out similar. The only two large differences can be identified in the themes *Assessing the value of IT investments* (America scores more than 0,5 higher than European assessments), and *Governance of public-private-civic relationships* (again American experts assess the theme approx. 0,4 higher than European experts). When comparing Asia and Australia, it can be concluded that the experts also assessed the themes rather similar. The three themes having a diverging score are: Mission-oriented goals and performance management (the difference in score is about 1,0, where Asian experts assess the theme much higher), *Cyber infrastructures* (Asian experts rank the theme higher than Australian), and *Crossing borders*
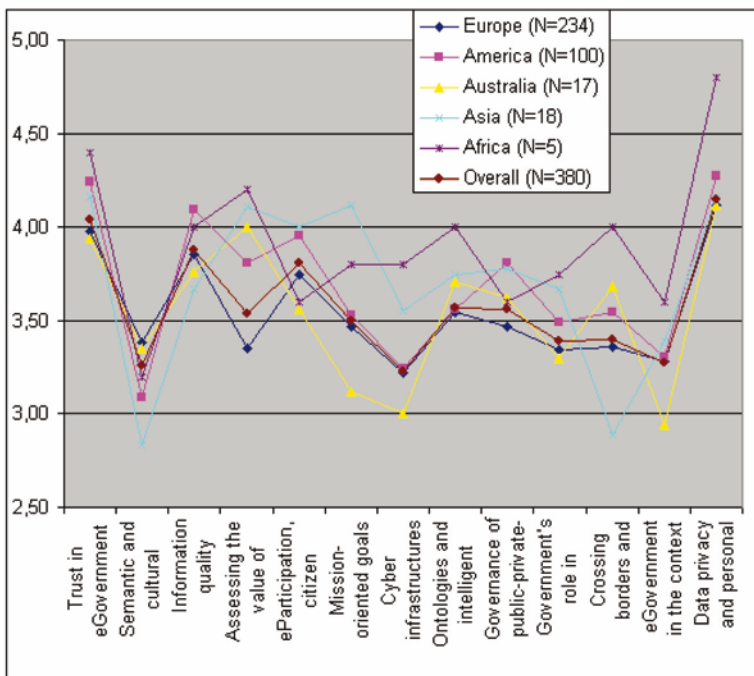
Figure 35: *Scores grouped by continents (N=374; 6 experts did not indicate the country)*

and the need for governance capabilities (interestingly, Australian experts rank the theme higher than Asian experts). The most significant variances can be recognised in the assessments by African experts. Although only 5 experts participated, the mean value of African experts is in most cases the highest in respect to the mean values of importance assessment by experts from other continents. The only theme ranked below all other scores is *eParticipation, citizen engagement and democratic processes*.

Figure 36 shows the assessment details across European regions. Several details of comparison are provided in this figure. Overall, the experts from the non-EU countries assessed the research themes as significantly more important than the EU Member State experts. Among them, experts from the Balkan States, Russia/Ukraine and also the experts from the new EU Member States ranked most research themes as significantly more important than experts from the old EU Member States. These outcomes are confirming the regional differences already identified in the scenario-building workshops (cf. section 4.4.2).

It is also interesting to note that the scores from Norway and Switzerland outperformed the ones from the old EU Member States significantly. For example, the theme *Assessing the value of government ICT investments* scores above 4,25 among the experts from
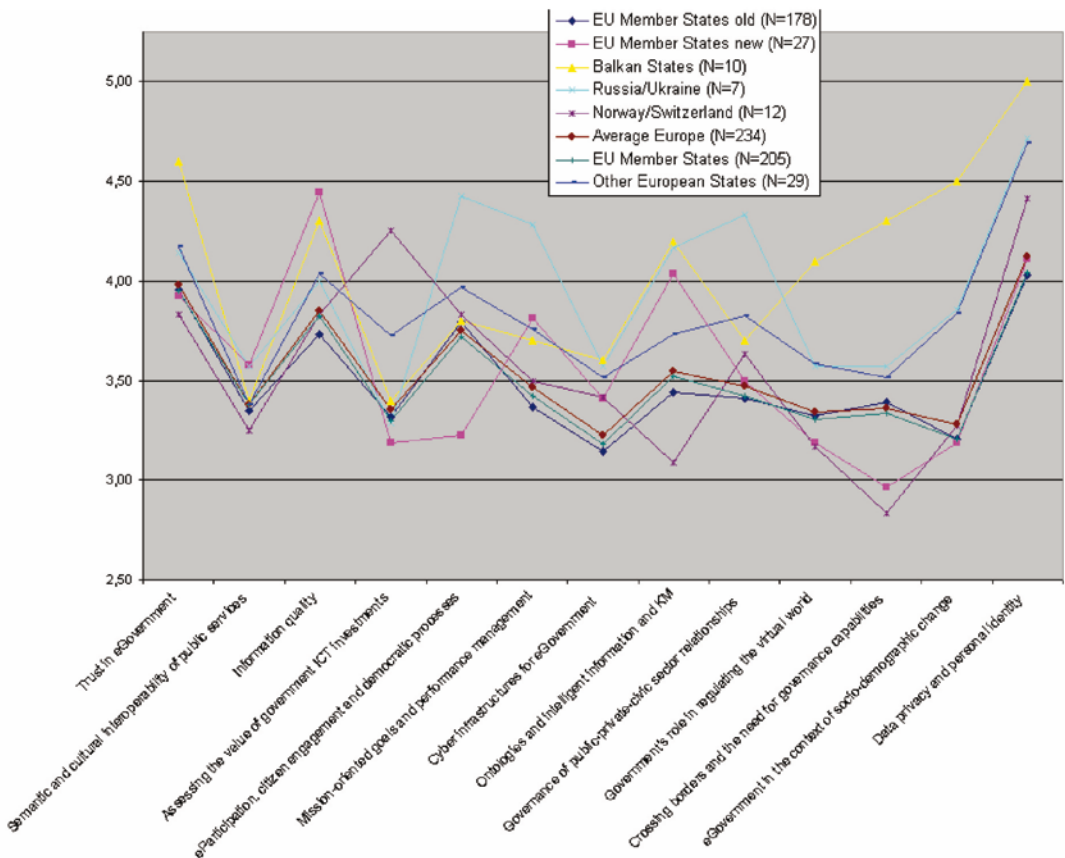
Figure 36: *Assessment differences grouped according to European regions (N=234 experts from Europe)*

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Norway and Switzerland, while most other experts ranked it below 3,5. On the other hand, these experts assessed the theme *crossing borders and the need for governance capabilities* even below 3. The second-lowest score was given to the theme *ontologies and intelligent information and knowledge management*. Some similar assessment can also be identified in the rankings of new EU Member States and rankings given by experts from Russia and Ukraine. The most significant variance in their assessment is in the scores for the theme eParticipation, citizen engagement and democratic processes. While experts from Russia/Ukraine rank this theme highest (score nearly 4,5), new EU Member States experts rank this theme lowest with a score of approx. 3,2.

Last but not least there are differences between America an Asia. The left side of Figure 37 gives an overview of regional differences among the assessments in North and South America. A generally higher assessment by experts from South America can be noticed. The chart at the right side of Figure 37 indicates some differences in perceived importance of certain eGovernment research themes by experts from the Near East. Main variances can be identified for the themes *cyber infrastructures*, *ontologies and intelligent information and knowledge management*, and *governance of public-private-civic sector relationships*. All three themes are ranked higher from experts in the Near East.

When performing the online assessment, experts were also asked to provide comments on the general aspects of eGovernment or the specific method of surveying. Overall, a very positive response could be recognised. Experts stressed the need of a structured method of planning research in eGovernment, and many of them commented that they perceive the work of eGovRTD2020 as very valuable.
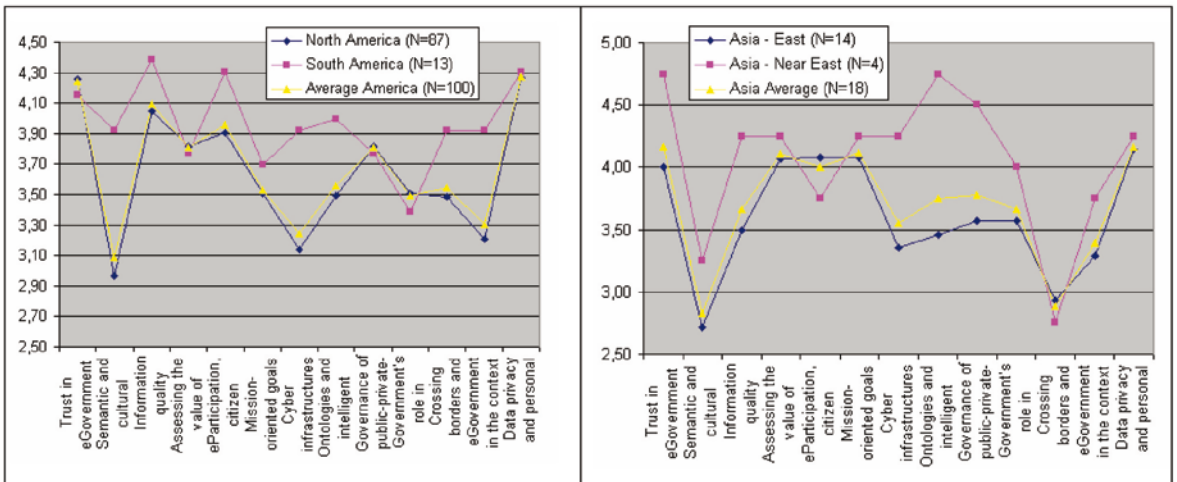
Figure 37: *Regional differences in the assessment of experts in America (left side) and Asia (right side)*

7. *Viewing the results from a wider perspective*
Author: *Sharon S. Dawes*

eGovRTD2020 embodies a comprehensive and rigorous approach to assessing and understanding eGovernment as a complex and dynamic socio-technical system. The methodology encompasses both broad vision and detailed analysis. The scenarios, for example, present a set of coherent, alternative visions of the future for society, government, and ICTs. The gap analysis extracts the major discontinuities, unknowns, and contrasts between the situation today (examined in the state of play) and these possible futures. The roadmapping effort closely examined the scenarios, gaps, and detailed underlying data from the international workshops. The final product comprises thirteen recurring themes that cut across the current state, the future scenarios, and the gaps in current practice and knowledge. Each theme is the basis for a research roadmap. Together, the roadmaps cover the wide range of challenges that lay before us.
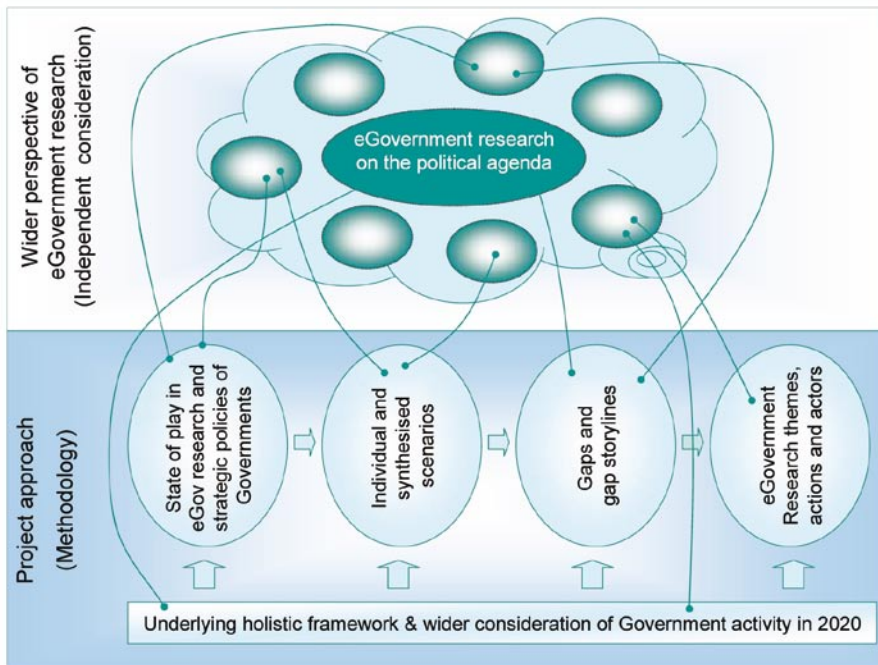
Figure 38: *Methodology of putting the results of eGovRTD2020 into a wider perspective thereby linking general aspects with concrete project results*

In this chapter, we depart from the stepwise process of the formal methodology to consider the result as a whole. This shift in perspective, illustrated in Figure 38, is an opportunity to reflect on the broad landscape of findings and conclusions and to consider more freely how key factors may interact to shape the future of government and society. From this vantage point, we comment on the associations, conflicts, and synergies that are likely to emerge among these factors in the future. These interactions will influence the agenda not only for eGovernment research, but also for policy making, application, management, and education. They may also suggest ways to forge more mutually beneficial links between research results and improved practices.

7.1 Factors that influence the future

The reflections in this chapter rest on an informal content analysis of the findings from the state of play, the scenarios, the gap analysis and thematic roadmaps, plus expert reviews. The documents associated with each of these steps in the formal methodology were reviewed to identify the recurrence of key factors across different sets of data and analysis. This review revealed a large number of factors that appear repeatedly throughout the research, although they appear in a variety of contexts and relationships. In all, we found more than sixty concepts, ideas, and trends that exhibited this multi-faceted character.

For example, the concept of *trust* appears many times across the various analyses. Trust in government is discussed in every scenario; trust in the market and trust in civil society also appear frequently. Trust emerged as a major theme in the gap analysis, indicating that the concept is poorly defined and understood despite past and current research in both social and information sciences. Trust was also selected by the participants in two special validation workshops for in depth discussion. It is therefore prominent among the final 13 research themes and their associated research roadmaps.

Similarly, *information quality* appears frequently across all steps of the methodology. It is a topic of current research but also is cited frequently as a technical issue, as an organisational requirement, as related to trust and confidence in government, as a requirement for assuring the validity of complex interactions, and as necessary for good performance of systems and services that cross organisational or sectoral boundaries. Information quality also emerged as one of the 13 final research themes from the validation workshops.

Certain technologies also appear in many parts of the research. For instance, *mobile and wireless technologies* figure prominently in the scenarios. They are positively associated with such factors as individual autonomy and convenience, while negatively associated with others such as automatic monitoring and surveillance. These technologies are the focus of existing research, yet many of the future scenarios suggest much more research, development, testing, and evaluation is needed.

These and other factors identified through the same process were clustered into six logical groups, each of which represents a common central idea. They are the purpose and role of government, societal trends, changing technologies, information management, human elements, and interaction and complexity. In order to better understand these factors, we grouped them into clusters for which we could identify (cf. Figure 39):

- *The purpose and role of government:* Much of the discussion and analysis associated with the scenario and roadmapping workshops had to do with a fundamental question – "In the future, what will be, or should be, the purpose and role of government?" Accordingly, a number of factors are linked to this crucial concern. These include the need for a well-articulated legal framework for eGovernment within and across nation-states as well as models and methods for assessing the performance, integration, and public value of eGovernment. In addition, traditional concerns about the distribution and exercise of governmental power and responsibilities remain; they include accountability, transparency, and stewardship as well as the responsibilities and influences of actors outside of government. Within government, the capabilities of the civil service, efficiency and effectiveness of processes and practices, and diversity of governmental organisations were all prominent.
- *Societal trends:* Trends in society at large will have varying influences on the future. Demographic trends such as age distribution, birth rates, and migration, combined

with globalisation, multi-culturalism, privatisation and institutional change are strong forces outside the control of government. Economic conditions, social tensions, geographic mobility and the distribution of wealth, jobs and workers are also important factors which affect political participation, sectarian conflicts, and the digital divide.

- *Changing technologies*: Unquestionably, ICTs have had, and will continue to have, dramatic effects on the worlds of home, work, and society. Technologies that do not depend on a particular place or device were prominent in the research findings, among them mobile phones and other wireless devices, and ubiquitous sensors capable of automatic data gathering and monitoring. Intelligent agents, interfaces, forensics, and reasoning could aid users and analysts, while architectures, shared services, security, authentication, and reusable building blocks could form the foundation of a comprehensive cyber infrastructure. Social software, visualisation, and virtualisation may offer the means to explore, or exploit, new communities and relationships.
- *Information management:* This cluster comprises a wide range of concerns, concepts, tools, and practices. Some, such as metadata, have to do with assuring the definition, quality, and integrity of information content. Others focus on information repositories such as digital libraries and archives. Still others pertain to tools for information access, use, analysis, and preservation such as search and retrieval, ontologies, knowledge visualisation, knowledge management, and information forensics.
- *Human elements:* The factors associated with individuals go far beyond the notions of human-computer interaction. For all people, integrity of self, identity, autonomy, personal choice, privacy, trust, adjustment and learning, and acceptance of change are essential considerations without regard to any particular technology. When ICTs are involved, additional factors come into play for individuals including ability and means of access to information, dealing with information overload, and the role and influence of users in the design and operation of systems that affect them.
- *Interaction and complexity*: The final cluster encompasses a set of factors that represent the challenges of crossing of technical, organisational, institutional and personal boundaries. In the technology realm these include multi-channel access to information and services, system interoperability, and distributed and multi-agent systems. In the social realm, interaction and complexity are represented by all kinds of cross-boundary interactions including schemes of collaboration, cooperation, and competition. These demand complex communication, management, and governance mechanisms. For both realms, additional factors include risk management and the ability to discern, understand, and respond to both planned and unexpected dynamics among systems and subsystems.

To some extent the factors within each cluster affect one another, resulting in different directions for development or different areas of emphasis within the larger idea they represent. More important, perhaps, each cluster represents a set of trends, developments, actions, preferences, and choices that are at least moderately independent of the other clusters. At the same time, the main effects of each cluster interact with the other clusters in both predictable and unexpected ways. The social elements and the technical aspects are continually evolving on their own while continuously interacting with each other in ways that cannot be overtly controlled. In other words, they represent a dynamic and open socio-technical system (Forrester, 1961, Thompson, 1967, Trist, 1981).
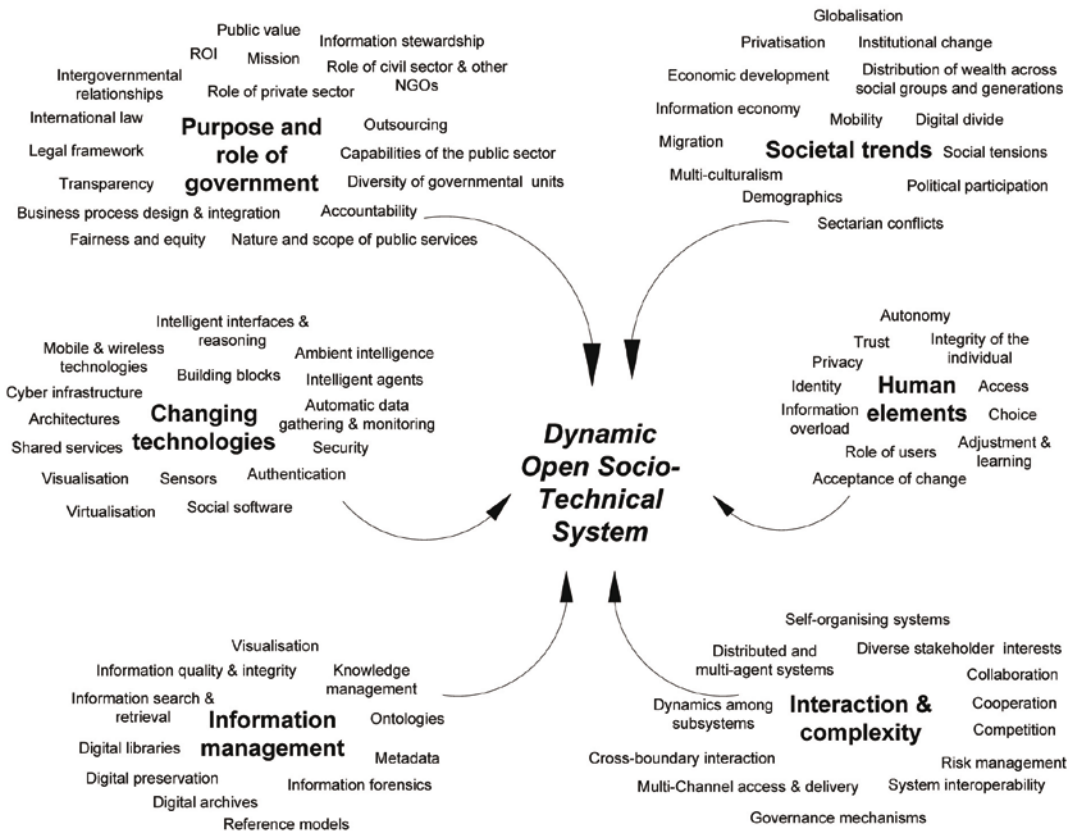
Figure 39: *Key elements of eGovernment as a dynamic and open socio-technical system*

Such systems are subject to influence and change from within and from the external environment. Feedback, adjustment, learning and adaptation all take place, often without being directed or managed by any master plan, or set of rules, or leaders. The individual elements of such systems interact in a variety of ways to produce results that are both planned and unexpected. Given human and institutional limitations for prediction and control, the interactions among these six clusters are capable of producing any number of possible future situations, with associated challenges, risks, and opportunities. From this perspective, the notion of eGovernment moves well beyond today's focus on services to citizens. Instead, it becomes enmeshed in the powerful forces that are reshaping the fundamental character of government and its role in a multi-layered geopolitical world that is no longer defined mainly by local, regional, or national borders.

7.2 Implications for the future of eGovernment research

Returning to the 13 research themes derived from the roadmapping effort, we can see that their key ideas are distributed across the six clusters illustrated in Figure 39. For instance, trust and privacy are among the Human elements; public value and the roles of the private and civic sectors appear in the cluster on the Purpose and role of government; information quality and onotologies are factors within the Information management cluster; and

multi-culturalism and socio-demographic change are important Societal trends. Cyber infrastructure and virtualisation represent some of the Changing technologies factors and the Interaction and complexity cluster includes cross-boundary interactions, interoperability, and governance mechanisms.

Each theme from the roadmapping work represents a strong thread of concern that, by itself, is worthy of serious and sustained future research. However, the broader perspective taken here suggests there are many more ways to perceive the challenges ahead and to design research programmes that will address them. This can be accomplished by taking advantage of a "big picture" view of the future as a complex and dynamic system (or set of systems), open to many kinds of influence and change. From this vantage point, important research questions and programmes could be constructed by drawing together factors and themes from different clusters and examining how they do, could, or should interact. A few examples are outlined in Figure 40, such as:

- What governance mechanisms are needed to oversee and assure the quality and integrity of a ubiquitous cyber infrastructure for eGovernment functions when those functions are distributed across public, private, and civic organisations? (Possible elements of this research are highlighted in blue).
- What are the necessary elements of an international legal framework for authenticating and protecting personal identity? What are the risks, benefits, and costs of such a framework and how are they distributed across stakeholder groups? (Possible elements are highlighted in yellow).
- What policies, technologies, processes, and information management techniques can government adopt to help assure equal and culturally appropriate access to information and services regardless of an individual's language or cultural background? What complementary tools could individuals from different language and cultural groups adopt to facilitate choice and autonomy in their interactions with government? (Possible elements are highlighted in green).

Looking at the issues in this way suggests a much larger, more nuanced, and more integrated research agenda than would be possible by looking at the key themes separately. Many different research projects could be designed and supported that increase knowledge about important eGovernment questions. Beyond combining factors in novel ways to generate additional research questions, however, this view also makes it possible to begin to investigate the "big picture" itself and to better understand the holistic and dynamic nature of this entire domain.

In one sense, this view could serve as a checklist of concerns that need both research and policy attention. eGovernment programmes and projects sponsored by any government could be assessed against this more holistic map to identify where knowledge gaps continue to exist and how they might be filled by new initiatives. This map of concerns can also be used to determine where research and innovation investments are being made and whether the distribution of resources across different concerns is reasonably balanced or skewed toward certain topics while skimming or ignoring others.

7.2.1 Implications for policy makers and public administrations

Just as the research agenda can be deepened and expanded by taking a wider perspective, policy makers and public administrations can be assisted to view and consider policy options and administrative mechanisms in a much wider context. Some questions that could be used for these kinds of assessments include:
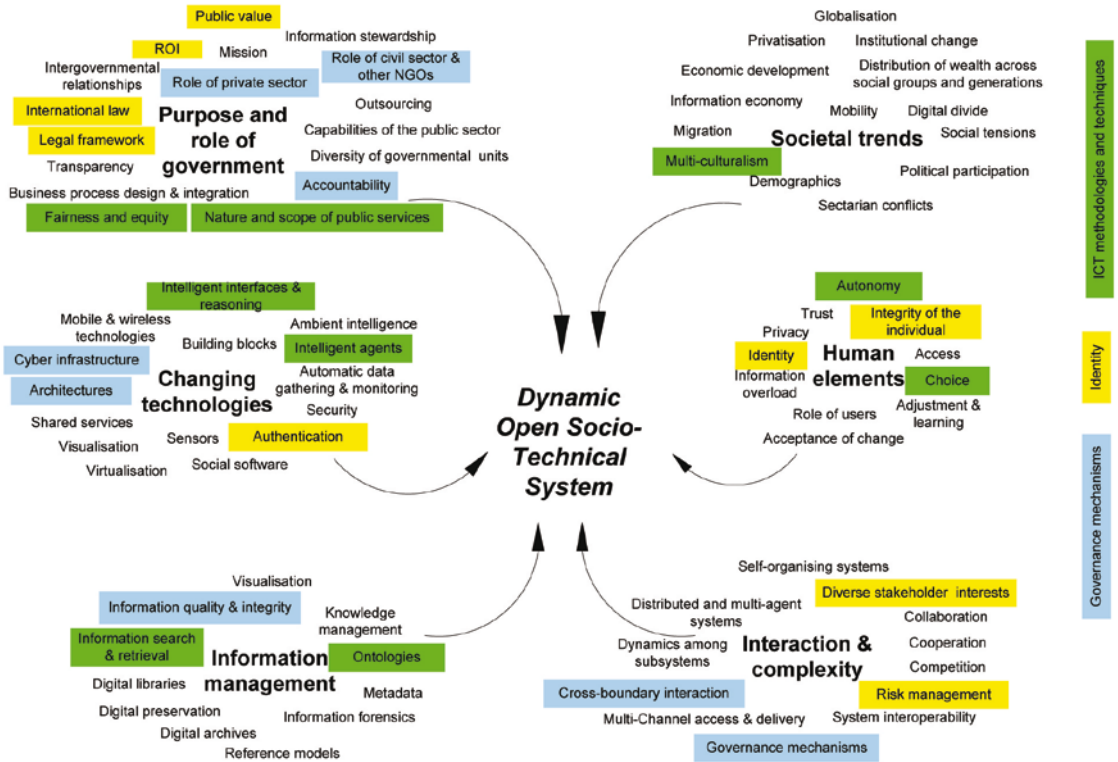
Figure 40: *Derivation of additional research questions*

- What are the national, regional, and local implications of international action on eGovernment concerns?
- How can the impact of decisions made and systems designed at higher levels of government be predicted and understood at lower levels? What kind of analysis or dialog would assist in mutual understanding and action?
- To what extent are government's fundamental responsibilities and powers enhanced, changed, challenged, or thwarted by delegating some eGovernment responsibilities to private actors? How can non-governmental actors be held accountable for their decisions and activities?
- What is the "total cost of ownership" of an eGovernment initiative and how are these costs (both hard and soft) distributed among the various organisations, groups, and individuals involved?
- What might be the unintended consequences of an eGovernment initiative? How can they be avoided?
- To what extent is the information available to support a government decision or programme adequate, available, appropriate, and trustworthy for its purpose?
- What role can citizens and civil society play in helping to design eGovernment services, systems, and policies that are multi-cultural?

These illustrations show how the policy agenda for eGovernment is inevitably embedded in the interplay among political, organisational, technical and social concerns.

7.2.2 Implications for academic and executive education

All of the foregoing discussion is also a basis for advocating for multidisciplinary and multi-cultural education for present and future government officials, as well as for academics and researchers.

For students who aspire to become future government leaders, formal university education programmes should include not only a foundation in political science and public administration and analytical methods, but also advanced training that introduces the ways in which information, communication, and technology serve as assets or tools for public administration and democratic processes. Theses, internships, and exchanges with universities in other places could be used to emphasise and broaden students' understanding of the issues, risks, and opportunities that ICT's present to government leaders, civil servants, and society at large.

Academic programmes to train the future generation of professors and researchers, should include not only substantive study of public administration and policy, political science and sociology, but also computer and information science, management science, organisational behaviour, other aspects sociology. For researchers training needs to include the skills to design, conduct, and evaluate multidisciplinary, comparative, and trans-national research. Multidisciplinary work focuses several theoretical lenses and traditions on a common question. Comparative work generally studies a single phenomenon that occurs in multiple countries or cultures, making explicit comparisons and identifying both ideographic and universal findings. Trans-national work focuses on problems or needs that demand the interaction of multiple countries. Examples include border control, regulating international trade and transportation, and fighting trafficking in drugs or arms.

For current government executives, ongoing professional education could take advantage of the many "natural experiments" that are going on around the world to infuse public functions with better information, wider communication, and new technologies. Case studies, field visits, and specialised international institutes drawing participants from different professions, countries and cultures, would be a relatively well-targeted way to accomplish this kind of learning. Such programmes could be brief but still have substantial value and impact. They would have the added benefit of providing the opportunity for officials in different countries and levels of government to engage with one another over their common responsibilities and begin to broaden their knowledge and experiences to encompass problems and needs that require truly international action.

7.2.3 Implications for ICT industry

Technology development will continue to be an important thread of eGovernment research. In all eGovRTD2020 scenarios, the envisioned technology tools provide more and better functionality with less human intervention, some to control human action and others to enhance human capabilities. The ICT industry will clearly have a major stake and ongoing role in developing new tools for commercial markets. It will also be an essential partner in creating a cyber infrastructure for eGovernment and in solving increasingly difficult problems associated with information management and all forms of system complexity.

Nevertheless, the research themes and roadmaps contemplate these technological advances as embedded in and intertwined with social, political, and organisational change.

7.3 Government-research-industry partnerships:
an opportunity for eGovernment living labs

Government, the research community, and industry will all be necessary participants in the future development of eGovernment. But this three-way partnership will not be enough to address successfully the many issues raised by the eGovRTD2020 project results. Actual citizens, social groups, civil servants, and communities will also need to be involved if the human elements, societal trends, and role and purpose of government are to be given sufficient attention. To achieve holistic understanding we will need research and development relationships that cross sectoral boundaries and include substantial roles for individuals, communities, and government professionals as co-creators in this effort to invent the future.

Following the philosophy of living labs (European Commission, 2006a), future eGovernment development will move forward most effectively as an open living laboratory that includes participation of users in design, prototyping, development, testing, deployment, and evaluation. In this way, we are more likely to produce useful, desirable, and affordable policies, systems, and services that deliver substantial and sustainable public value.

8. Recommendations

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Embarking on the results of the formal methodological process and the findings the eGovRTD2020 project delivered, in this chapter we abandon the neutral and scientific stance and take a position to selectively argue how our findings bear on current and future eGovernment developments and policy at the EU level. We first briefly recall the EU policy developments in the field of an Information Society in general, and of eGovernment in particular. We thereby use the peculiar prism of the changing focus of related evaluation and measurement exercises and methodologies. Next we show the undisputable relevance that the thirteen research themes (with their detailed roadmap and implementation plan illustrated in chapter 6) have with regard to the current EU policy objectives and priorities. We conclude with the key messages that the success of eGovernment is highly dependent on the continuation of funding for core research. We will argue that funding only implementation pilots
* will not help overcome the existing barriers,
* will not fill the evidenced gaps, and
* will not help realise the more desirable scenarios whilst minimising the risks of the undesirable ones becoming real.

8.1 EU policy developments

The EU policies on Information Society and in particular on eGovernment can be divided into two major phases in the period of the year 2000 to the present (2007), which
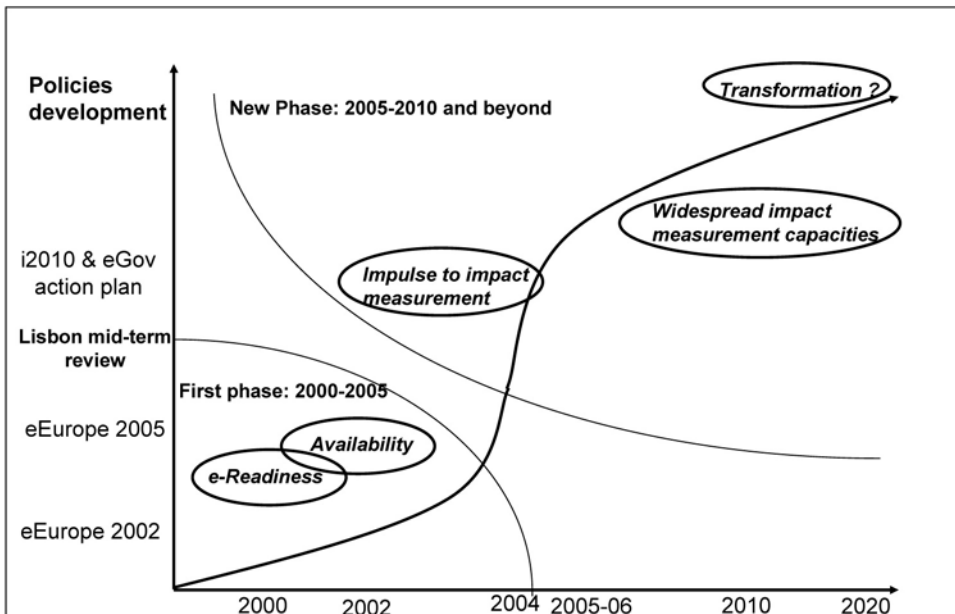

Figure 41: *EU Information Society and eGovernment measurement focus*

are indicate in Figure 41 (Codagnone and Boccardelli, 2006). The different policy priorities of these two phases reflect different foci of implementation, evaluation and measurement (cf. Codagnone and Boccardelli, 2006, Codagnone et al., 2006):

- First, a phase of spurring implementation and measuring eReadiness and availability (phase 2000 – 2005), which was based on the strategic policies of eEurope 2002 and eEurope 2005.
- Second, a phase of reflection of impact assessment and measurement (2007 – 2010) based on the i2010 policy and the eGovernment action plan of the EC.

In the initial phase the EU, in its attempt to be the catalyst for Member States, has launched two Action Plans – eEurope 2002 (European Commission, 2000) and eEurope 2005 (European Commission, 2002) – which generated a positive momentum for the short-term development of the Information Society (eEurope Advisory Group Work Group No.3, 2005). The main focus in the initial stage has been to create the precursors for the development of an Information Society and of eGovernment (eReadiness). The aim was to rapidly bring public services online (key pillars were availability and sophistication of online services).

The point of discontinuity is represented by the publication of the mid-term review of the Lisbon Strategy process, also known as Kok report, stressing the delays in achieving the Lisbon goals (European Commission, 2004). Slow economic growth as compared to other regions of the world, an ageing population and relatively slow adoption rates for Information Communications Technologies (ICT) in all sectors of society was claimed among the major challenges Europe still has to face according to the *Kok report*. The delay in adopting ICTs in general and/or in their optimal application is a crucial challenge, for it is widely recognised that ICTs play a key role in economic growth. In OECD countries, for instance, investments in ICT have been shown to account for between 0.35 and 0.80 percentage points of growth in GDP over the period 1995-2001 (OECD, 2003). Not surprisingly, strong evidence proved that slower adoption and sub-optimal use of ICT in Europe is the main determinant of its productivity gap vis-à-vis the USA (e.g. Ark et al., 2003).

In the view of re-launching the Lisbon agenda, the role of governments (and thus of eGovernment) is key. In this respect, it is worth quoting the following passage from a background document prepared for a meeting of the extended Ministerial Troika of Ministers of Public Administration held on 4 November 2004 in The Netherlands *(EPAN 2004)*:

> "At present, the role of the public administrations in the Lisbon Strategy is limited. The conditioning role of governments (for example setting targets for R&D) is considered rather than their performing role as large organisations. Since governments have a large share in the realisation of the social and economic development in the European Union, it is worthwhile to re-value the role of the public administrations in the Lisbon process. After all, governments may have to improve the service to private enterprises and citizens in order to be able to achieve the Lisbon goals. Furthermore, the size of the European public sector as such seems so big that it can hardly be overlooked."

The 2005 Spring European Council with the partnership on growth and jobs has set a new start for the Lisbon Strategy in which knowledge and innovation have been deemed among the drivers of growth and affirmed the importance of building a fully inclusive information society, based on the widespread use of ICT in public services, SMEs and households (European Commission, 2005a).

It is clear then that the review and re-launch of the Lisbon Strategy has led all EU policies, and particularly those of Information Society and eGovernment, to focus on clearly identified and measurable objectives in terms of concrete socio-economic impact and outcomes in a sharper and more stringent way. This was actually already affirmed in the EC communication on the role of eGovernment unveiled in Fall 2003 (European Commission, 2003). It led to the launch of the MODINIS study on the economics of eGovernment known as eGEP (see Codagnone and Boccardelli, 2006, Codagnone et al., 2006).

The new EC Information Society strategy i2010, which was launched in spring 2005, further stated that "*much remains to be done to demonstrate economic impact and social acceptance*" with respect to the benefits of online public services (European Commission, 2005b). About one year later, the Commission published a new eGovernment Action Plan, which was heavily impact measurement oriented (European Commission, 2006b). The impact oriented objectives for eGovernment declared in these two policy documents resulted in ICT oriented developments of the public sector to be strengthened via the new Competitiveness and Innovation Programme (CIP), which was approved by the EC in spring 2005, too (European Commission, 2005c).

The two afore mentioned policy documents and the CIP are the benchmarks against which the importance of the 13 research themes presented in chapter 6 will be underlined in section 8.2. The objectives towards which to benchmark the research themes of eGovRTD2020 are briefly reported here.

The three key objectives of the Information Society strategy i2010 are the following:
1. A Single European Information Space offering affordable and secure high bandwidth communications, rich and diverse content and digital services (EC 2000b)
2. World class performance in research and innovation in ICT by closing the gap with Europe's leading competitors (EC 2000b)
3. An Information Society that is inclusive, provides high quality public services and promotes quality of life (EC 2000b)

The five objectives set for eGovernment 2010 (EC 2006) are the following:
1. No citizen left behind: advancing inclusion through eGovernment so that by 2010 all citizens benefit from trusted, innovative services and easy access for all;
2. Making efficiency and effectiveness a reality – significantly contributing, by 2010, to high user satisfaction, transparency and accountability, a lighter administrative burden and efficiency gains;
3. Implementing high-impact key services for citizens and businesses - by 2010, 100% of public procurement will be available electronically, with 50% actual take-up, with agreement on cooperation on further high-impact online citizen services;
4. Putting key enablers in place - enabling citizens and businesses to benefit, by 2010, from convenient, secure and interoperable authenticated access across Europe to public services;
5. Strengthening participation and democratic decision-making - demonstrating, by 2010, tools for effective public debate and participation in democratic decision-making.

8.2 Research themes' relevance for strategic EU policy objectives

Table 35 plots the 13 research themes of eGovRTD2020 against objective one of i2010 and the five objectives of the eGovernment Action Plan. The choice to include only objec-

tive one of the i2010 strategy is based on the grounds that a) objective three is actually embodied in the five objectives of the eGovernment Action Plan and, thus, is abandoned for reasons of reducing redundancy. Objective two of i2010 is actually framed clearly as concerning the private sector and society and not government, and was therefore left out.

The contribution eGovernment practice and research can produce in achieving a 'Single European Information Space' (objective one of i2010), especially in terms of security and richness of contents and services, is straightforward and justifies the inclusion of this objective in the comparison. The normative scale used and clearly explained in the table expresses the assessment of the impact (contribution) that financing and conducting research on each of the 13 research themes would have in the achievement of the listed policy objectives. This assessment results from aggregating the view expressed individually by the authors of this book.

Research Themes \ Policy objectives	European Information Space	No citizen left behind	Efficiency and Effectiveness	High Impact Service	Key enablers	eParticipation	Average score
Trust in eGovernment	3	4	2	2	3	4	3,0
Semantic and cultural interoperability of public services	4	4	2	3	4	2	3,2
Information quality	4	2	2	3	4	3	3,0
Assessing the value of government ICT investments	2	1	4	2	3	1	2,2
eParticipation, citizen engagement and democratic processes	2	4	1	0	0	4	1,8
Mission-oriented goals and performance management	0	3	4	4	2	3	2,7
Cyber infrastructures for eGovernment	3	1	2	2	4	1	2,2
Ontologies and intelligent information and knowledge management	4	3	3	2	4	3	3,2
Governance of public-private-civic sector relationships	1	3	4	2	3	3	2,7
Government's role in the virtual world	4	2	0	3	2	3	2,3
Crossing borders and the need for governance capabilities	4	1	2	3	4	2	2,7
eGovernment in the context of socio-demographic change	2	4	1	3	1	4	2,5
Data Priviay and personal identification	4	4	2	3	3	3	3,2
Legend: 4= direct high impact; 3= direct medium impact; 2= indirect significant impact; 1= indirect moderate impact; 0=no impact							

Table 35: eGovRTD2020 research themes and EC policy objectives

Recalling again in detail each of the 13 research themes, actions and time schedule as illustrated in chapter 6 and to show in depth how each research action contributes to each policy objective is beyond the scope here. Our aim is to provide a general and selective narrative illustration in addition to the assessment provided in the table above.

At a general level it suffices to observe how all of our 13 themes can directly or indirectly help achieve the identified policy objectives. While in the methodology used to extract the research themes bottom up we did not use these policy objectives in conducting the workshops, it is actually an outstanding result that all of them are in some way instrumental in fostering directly or indirectly the progress toward such objectives. These thirteen themes, though formalised and reproduced by the eGovRTD2020 consortium, convey the views of hundreds of stakeholders in Europe and beyond, and they embody the crucial EU policy objectives in this domain.

For instance, how can more inclusion and participation also by way of eGovernment be achieved without further research on the theme of fostering 'Trust in eGovernment', 'Securing data privacy and personal identification', and increasing 'Citizen engagement and democratic processes via eParticipation'? Here there is a clear and direct very high impact of such research themes on objectives one and five of the eGovernment Action Plan and on the general philosophy of inclusive information society shaping the i2010 strategy. This is about a more inclusive eGovernment that better understands the needs of all citizens, also of those who find themselves not at ease with the intricacy of public administration. An issue that can very well be captured from the passage below, we have taken from a satiric novel, containing the considerations of a disillusioned professor at vocational teaching institutions:

> "… And his own attempt to change the curriculum to more practical matters, like how to fill in Tax forms, claim Unemployment Benefit, and generally move with some confidence through the maze of bureaucratic complications that had turned the Welfare State into a piggy-bank for the middle class and literate skivers, and an incomprehensible and humiliating nightmare of forms and jargon for the provident poor, had been thwarted by the lunatic theories of so called educationalists of the sixties like Dr. Mayfield, and the equally irrational spending policies of the seventies" (Scarpe, 2004, p. 43).

Leaving aside the somehow 'politically incorrect' educational implications of this quote[46], the characterisation of the Welfare State and of the barriers for the less socially included to deal with it and with government in general are illuminating and clearly to the point here. Inclusive eGovernment simply through ICT simplifying the processes (pre-filled forms and automatic entitlement to benefits) or by way of ICT enabled intermediaries helping the socially excluded or those at risk of exclusion achieve their entitlements or comply with government obligations would be a great contribution to social inclusion and also to increasing trust in government and participation to society on the side of the more marginalised and passive segment of society (which include not only grown up unemployed or low paid workers, but also marginalised youth). So far eGovernment applications and services have not achieved this goal. One reason is that more interdisciplinary research, joining the ICT and social studies, is needed in order to harness the potential of technology to the peculiar needs of well identified target groups. Moreover, if this goal is achieved, take-up of online public services will increase and, consequently, efficiency and effectiveness will result in tangible gains.

Research on 'Information quality', 'Ontologies and intelligent information and knowledge management' and on 'semantic and cultural interoperability of public services' are main avenues to bring about a 'Single European Information Space' where information pollution, unreliability and overload are minimised, and cultural barriers are finally overcome for both EU nationals and for immigrants and other cultural minorities. Likewise, advanced technologies for targeted information access, search and retrieval, as well as proactive information provision contribute to realising the EU policy objective. It can be argued that even the cyber infrastructures for eGovernment theme provides a basic precondition for a single European information space. If technology is not in place, large-scale information sharing and access will remain a vision. The themes mentioned here

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46. They are certainly not politically correct as they entail that in technical and vocational educational institutions students should be trained to do practical things rather than 'losing' time to absorb general cultural notions that will be of no use to them.

have also a direct impact on achieving inclusion and participation. Furthermore, they contribute to other objectives such as putting in place 'key enablers' for public services.

Another cluster of research themes contributes to the high-level EU policy issue of 'Efficiency and Effectiveness' is 'Assessing the value of government ICT investments', 'Mission-oriented goals and performance management', and 'Governance of public-private-civic sector relationships'. They help to achieve higher efficiency and effectiveness as follows: Whilst the 'Assessment of the value of government ICT investments' calls for reflection on who should invest and provide what kind of cyber infrastructures and ICT applications, the 'Mission-oriented goals and performance management' theme requires general reflection of the service portfolio of governments, and of overall government structures, in order to create public value and meeting the target objectives of public sector activity. As a result of the considerations and insights of these two themes, lean government and outsourcing as well as stronger 'Public-private-civic sector collaborations' may unveil options of more effective and efficient governance structures to provide public sector services (in various modes and through distinct channels).

Further argumentation could be provided that underline the support of the key EU policy objectives via the thirteen research themes of eGovRTD2020. If considered in their interplay and interdependencies, the research themes reach even beyond these EU policy objectives. E.g. 'Information quality' is a research theme emerging from several scenarios and potential unwanted futures: If a single European information space is an objective of the EU policies, this implies on the one hand that the information provided is reliable, trustworthy, treated accordingly within the frames of data privacy, etc. On the other hand, it must be of high quality and accessible to all, understandable for all, etc. without requiring highly sophisticated information search and mining techniques. With the ever growing information flood and with increasing risks of cyber crimes and data misuse, urgent action is required to provide comprehensive understanding of the complexity and impact of information quality on economic growth and public sector services, and proactive as well as preventive measures need to be established to prepare for potential large-scale denial of service attacks, breakdown of infrastructures and loss of valuable virtual information sources. Consequently, the research theme looks beyond the prosperous aspects of a single European Information Space, and recalls to prepare as well for potential risks emerging with such a vision becoming reality.

In a similar way, the research themes extend and enhance the key policy objectives of the EU. Just to mention another example: eGovernment in the context of socio-demographic change not only embarks on the fact of ageing. It recalls that other demographic changes (immigration, lack of workforce, movement of people towards certain sophisticated regions with high life-style, while others become very unpopular, climate change, etc.) have to be investigated as well in order to implement the policy goal of 'No citizen left behind', and to respond with proper eGovernment services. In turn, the eGovRTD2020 research themes provide a means to an end of implementing strategic policies. Moreover, the research themes enrich the policy objectives by adding a number of facets of potential future scenarios and thereby arguing certain needs of research and requests for streamlined developments (supporting positive futures and avoiding negative directions).

Some conclusions from these lines of argumentation are that there are a number of critical and unresolved issues, which have emerged from the study and which are framed into research themes. All of them have proven to be clearly relevant for the current impact focused EU policy objectives as shown in Table 35. Hence, they should be pursued under future research programmes and funding.

Apart from the policy relevance of each of the 13 research themes taken singularly and of all of them as comprehensive platform, a second important lesson evolves from their holistic and multidisciplinary nature. Again it is worth stressing that such 13 themes convey the voices of hundreds of stakeholders in Europe and beyond and such voices express loud and clear that key challenges to be researched for filling current gaps and ensuring the success of eGovernment are not merely to technology and technological research by themselves, but rather to holistic and multidisciplinary challenges and research. Research no doubt focussing on technology for government, but devoting equal, if not more, attention to the complex interaction of technology with the many social, economic, cultural, political, regulatory and legal factors included in the holistic framework is a key challenge to face in future eGovernment innovation and advancements towards the EU policy goals. The holistic framework has inspired the overall methodological approach of this project, as illustrated in the methodological chapter 2 and further unveiled and developed in the previous chapter 7, hence leading to a wider scope of consideration thereby reflecting potential positive and negative images of alternative futures for governments in 2020.

The views from the field as shaped in eGovRTD2020's 13 research themes confirm the claim that eGovernment is more about Government and about the other social systems with which it interacts than simply about the 'e' suffix and ICT per se. This argument is often only rhetorically made in strategic and policy documents. Yet, it is substantiated and documented in some lines of academic research, too. Accordingly, funded research on eGovernment in the future should be as much as possible multidisciplinary.

8.3 Final recommendations: beyond implementation pilots

As we write, the first IST call for proposals within the EC Framework Programme 7 (FP7) closed on May 8 2007 and, unlike what happened in FP5 and FP6, eGovernment was not among the research challenges and thus, at least in 2007 and 2008, basic fundamental research in this field will not be financed by the EU. Also in May 2007 the first call of the new Competitiveness and Innovation Programme (CIP) was open and the First Information Day workshop was held in Brussels on May 24, 2007. It is known at the time of writing, thus, that broadly defined eGovernment initiatives and activities will be supported by the ICT Policy Support Programme (ICTPSP), which is part of the CIP. A dedicated ICTPSP website was just released in March 2007[47], and the basic features of the ICTPSP are succinctly illustrated in a power point presentation downloadable from the mentioned website[48] and in the full blown work programme document also downloadable from the same website[49]. The key facts of CIP are[50]:

- Policy objective: boosting growth and jobs in Europe
- Budget: ca. € 3.6 Billion in a timeframe of 2007-2013

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47. See http://ec.europa.eu/information_society/activities/ict_psp/index_en.htm
48. See "ICT Policy Support Programme (CIP). http://ec.europa.eu/information_society/activities/ict_psp/ library/ ref_docs/docs/ict_psp_presentation_2007.pdf, accessed April 2007
49. See http://ec.europa.eu/information_society/activities/ict_psp/library/ref_docs/docs/cip_ictpsp_wp.pdf
50. See: http://ec.europa.eu/information_society/activities/ict_psp/library/ref_docs/docs/ ict_psp_ presentation_2007.pdf, accessed April 2007

- Three areas:
  - ❍ Entrepreneurship & innovation (with about € 2,170 Million)
  - ❍ ICT policy support (ICTPSP) with about € 730 Million of budget, and
  - ❍ Intelligent Energy Europe with about € 730 Million of budget

ICTPSP is a sizeable component of the CIP. Out of its total budget of 730 M€, the following priority areas will be financed:
- eGovernment;
- Ageing and Inclusion;
- eHealth;
- 'Horizontal' preparatory activities (initiatives for SMEs, intelligent cars, sustainable growth, privacy, promotion actions, benchmarking and studies on Information Society developments).

ICTPSP, in our view replicating with some changes the approaches of earlier programme such as *e*TEN and eContent will support the above activities, including eGovernment, through:
- Pilots (Type A and Type B) & Thematic networks (including best practice actions);
- Policy analyses, development & coordination with participating countries;
- Promotion, communication, information sharing & dissemination;

Type A pilot projects are expected to demonstrate service interoperability across the Member States or associated countries participating in the pilot and to achieve a sufficient critical mass to realise significant and meaningful impact. As such national administrations will be in the driving seat of such type of pilots. Type B pilots aim at a first implementation of an ICT-based innovative service portfolio addressing the needs of citizens, governments and businesses and will have to include all the actors of the value chain, thus administrations will be present but not as prominent as Type A pilots. The major implementation Type A pilots for eGovernment, to be launched probably in 2008, should focus on interoperability and aim at implementing a federated solution across Member States (probable fields being eProcurement and eID). As anticipated, this condition will by necessity involve national administrations in the driving seat with other stakeholders only in a supportive role.

Implementation pilots are positive instruments, as long as they are not the only one, and as long as more fundamental research is also financed. The scenario, however, for eGovernment is currently that the EU will only finance pilots and not research. This choice seems to imply that all major important eGovernment research has been conducted and that it is now only the time for deployment. Certainly FP5 and FP6 have produced appreciable research, but our findings show that the current development of eGovernment has not reached outstanding results and that many challenges are still to be solved with the help of fundamental research.

Implementation pilots will mostly finance technological development, but data shows that so far investments of public money to ICT-enabled public administrations by the EU and its 27 Member States have not be small: they steadily grew since the year 2000, and in 2004 they reached the total amount of about 36,5 billion of Euro (Codagnone and Cilli 2006, p. 56). Yet, despite these large investments, results in terms of impact and take-up are still to be demonstrated. This means that, to really make efficiency and effectiveness a reality and to increase the number of citizens using online public services (thus ensur-

ing more inclusion and participation) spending money for ICT alone is not enough. There exist some key challenges which can only be overcome via basic fundamental research on topics such as those of 13 research themes identified in eGovRTD2020.

Therefore our concluding recommendations are the following:
- Complement implementation pilots with funding for eGovernment research in the 13 identified areas;
- Ensure that new eGovernment research is holistic and multidisciplinary and that each funded research project strikes the right balance between strictly defined technological research and development on the one hand, and more socio-economic, cultural, organisational, political and regulatory and legal research on the other hand;
- Secure that fundamental research at the edge of transforming basic ICT innovations into large-scale applied solutions takes a wider view, including impact assessments, framework developments, and large-scale applicability of technology advancements;
- Require research proposals to tackle the complexity of socio-technical systems in eGovernment contexts, thereby embarking on a multidisciplinary approach and securing contributions to advance methods and tools which deal with the complexity of socio-technical systems in the public sector;
- Reinforce European and international researchers in the field of eGovernment to collaborate and contribute to the advancements of the field by working cross-disciplinary;
- Foster a stronger dialogue among the key actors of the field (academia, governments and ICT industry and consulting) when investigating eGovernment research themes by supporting the actors to create the necessary favourable environment of exchange and collaboration.
- Secure high-quality applied research through approving evidence of capabilities and competencies of project partners in the field of application.

9. *Concluding remarks*

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eGovRTD2020 was funded as a specific support action within the 6th framework programme of IST of the European Commission. Its main aims were to identify and characterise the key research challenges, required constituencies, and possible implementation models for holistic and dynamic governments in Europe and around the world in 2020 and beyond. These overall aims were supported by several key pillars:

- A strong underlying methodology, which comprehensively considered the key influencing factors forming government activities and its use of ICT;
- A balanced bottom-up and top-down approach, interacting with key actors in the field, and embarking on crucial and balanced multidisciplinary competencies within the project consortium;
- A clear and common understanding of the field, of what is at stake, of potential visions, the peculiarities forming the field, and the challenges emerging for the future;
- Motivating drivers from key strategic policies, complemented by unbiased brainstorming and joint collaboration of experts from different professions and fields;
- Continuous strong management of the process and observations of advancements going on elsewhere;
- A fruitful collaborative climate among project partners, and frequent physical and virtual exchanges and collaboration opportunities.

The underlying methodical framework for the entire project is described in chapter 2. This framework is considered a crucial product of the project, as it provides a comprehensive and consistent methodical guideline for futures research in terms of long-term planning of programme and science roadmaps, and strategy developments. This methodology can be applied by experts from governments, ICT consulting and academia alike. In addition, the methodology can be applied in a number of other contexts by adapting or replacing the holistic reference framework for eGovernment with a framework suitable to the context of a different subject area.

The project was designed in a sequence of four phases, comprising:

- An analysis of the state of play in eGovernment research and strategic implementation programmes, with international scope and at national levels of the EU Member States. The results are reported in chapter 3;
- A scenario-building exercise, depicting a number of potential future scenarios of how governments might interact with their constituencies using ICT, thereby providing public services which add value to the society, the market and the general public. The results are documented in chapter 4;
- An analysis of gaps emerging from the mismatch of current research with respect to future needs identified in the potential directions elaborated in the scenarios (see chapter 5 for the results); and
- A roadmapping exercise, which brought to bear thirteen themes for future eGovernment research, for which specific research measures, actors and timelines were developed in the scope of a roadmap. The results are presented in chapter 6.

The project results have further been reflected on in terms of a wider perspective and with the purpose to provide recommendations to key funding bodies such as the EC or national funding bodies, as well as to national governments and key policy decision-makers in governments and ICT industry / consulting (cf. chapters 7 and 8).

The recommendations and discussion of results from a wider perspective provide fun-

damental arguments for the need for future research in eGovernment. It can be argued that the research themes support the key policy objectives of the EU, while at the same time enlarging them with broader considerations of other governments around the globe. The thirteen research themes provide a crucial means to reach the target goals of the EU strategic policies. However, if basic and applied research is not supported and funded in the near future, there is a high risk that the strategic objectives defined for 2010 and beyond will not be reached. A vacuum of innovation may occur, which will create a significant barrier to economic growth and the development of an Information Society for all across Europe.

Actors in strategic positions in government, industry, and academic communities are called upon to take action to create an environment that welcomes and supports innovation within the public sector, and ensures close collaboration with the actors in academia and industry.

Continuation of eGovernment research has to be secured in Europe along side the pilot implementation projects foreseen in the new Competitiveness and Innovation Programme (CIP) - with the ICT Policy Support Programme (ICTPSP) which is the only area currently targeted to eGovernment.

The recommendations from eGovRTD2020 can better target, streamline and foster eGovernment research activities. A balanced strategy is needed which includes basic research in certain areas of eGovernment, a large portfolio of multidisciplinary applied research, and an effort to complement research with pilot implementation projects. Such a balanced portfolio will help achieve the strategic policies of the EU i2010 and the eGovernment Action Plan and can also help advance eGovernment strategies and public value in other parts of the world.

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Glossary

Accessibility indicates the degree (ease or barrier) of access and *usability* of ICT systems, service offers, applications and information via ICT (information and communication technology). Barriers to accessibility refer to technical, audio, visual, semantic and language barriers, lack of skills, exclusion of certain constituencies, etc. The overall aim is to minimise these barriers and to support the ease of use in order to avoid exclusion of individuals or even larger groups. When designing accessible systems, specific groups with functional impairments shall be asked to test and assess accessibility.

Accountability is a concept originating from the field of ethics and bearing several implications and various nuances. In the specific field of governance and public management studies, accountability means that those who work in the public sector must be able to demonstrate that their actions are in keeping with legal, moral, organisational or moral authority. Lately a particular understanding of the term relates to the capability of public agencies to keep the concrete results achieved transparent and open so the public can approve what public funding has been used for.

Authentication is the process of determining whether someone or something is, in fact, who or what it is declared to be. In the virtual world, it refers to verifying the digital identity of a person in a communication or transaction with the purpose to confirm that the identity provided belongs to the person he or she claims to be. Thereby, a certain attribute of a user certifies authorised access to systems or data.

Avatar is an Internet user's representation of himself or herself, whether in the form of a three-dimensional model (used in computer games), a two-dimensional icon or picture (used on Internet forums and other communities), or a text construct found on early systems. The term avatar can also refer to the personality connected with the screen name of an Internet user.

Back-office covers the processes and workflows of organisations which, unlike the *front-office*, are run in the internal part of an organisation and which are mostly invisible to the [external] customer or citizen. Examples include the processing of applications or the acts of issuing of notifications. Also, general management and accounting are seen as back-office processes. Middleware is used to link up (interoperate) the back-office with the front-office systems.

Black technologies are different means used by the mass media to purposefully shape the negative / positive opinion of society about a particular person, institution, process, etc. To discredit e.g. some organisation, a newspaper could publish articles intentionally providing wrong information about the organisation's activities, while emphasising the right behaviour of their competitors. This could destroy the good name of the company and prevent it from winning some important competitions.

Business process re-engineering (BPR); (re-engineering) is an approach to modernise and restructure main business processes in organisations with the aim to improving effectiveness, efficiency, service performance (productivity), and quality of products and services, whilst at the same time reducing costs and effort, and exploiting the potentials of modern ICT. BPR requires profound reconsideration of functions and radical redesign. Motivators are a rapid reaction to market changes and responding quickly to changing customer needs.

Category [in eGovRTD2020] refers to a cluster / group of similar dimensions leading to a more holistic understanding of eGovernment. As such, categories denote a domain or interactions between domains of the holistic framework for eGovernment.

Coherence is the idea of governments and agencies working together to achieve the benefits of eGovernment, particularly through the use of ICT and common standards. See also: -> *interoperability,* and -> *good governance.*

Creative commons is a non-profit organisation devoted to expanding the range of creative work available for others legally to build upon and share. It provides free tools, built within current copyright law, for authors, scientists, artists, and educators to mark their creative work with the freedoms they want it to carry. Creative commons licenses allow creators to choose how their work should be shared with others and allows users to access and use music, movies, images, and text online in accordance with those choices. Some licenses enable copyright holders to grant some or all of their rights to the public while retaining others through a variety of licensing and contract schemes including dedication to the public domain or open content licensing terms. The intention is to avoid the problems current copyright laws create for the sharing of information.

Data mining is the process, usually using ICT, of automatically analysing and synthesising large volumes of data to identify patterns and turn raw data into more intelligible information, using tools such as classification, association rules, clustering, etc.

Data privacy is a specifically emerging concern in the context of the Internet. See also: -> *Privacy*; -> *Data protection*.

Data protection is an emerging need, which is addressed in several initiatives to provide a range of measures to protect personal and sensitive data from unauthorised public access, and to control the flow of such sensitive data and information.

Digital divide describes the gap between the have's and have-not's in a society, which arises from the influence and use of information and communication technology. Causes of the digital divide may be exclusion due to certain access barriers (-> *accessibility)* or disadvantages because of unequal social and/or economical opportunities and development potentials for different individuals and social groups.

Digital government is the use of information and communication technology to support and improve public policies and government operations, engage citizens, and provide comprehensive and timely government services. The primary delivery models of digital government are Government-to-Citizen (G2C), Government-to-Business (G2B) and Government-to-Government (G2G). Digital Government is, to a large extent, a synonym of *eGovernment* mainly used in America. See also -> *eGovernment.*

Digital preservation refers to the ability to display, retrieve, and use digital data collections over a long time-span and in the face of rapidly changing technological and organisational infrastructures and elements. Electronic long-term archiving is a concept with similar purposes.

Dimension [in eGovRTD2020] is a variable depicting two opposing extremes on the future of eGovernment in 2020 and is a particular type of issue. For example, in the dimension "trust in government," one extreme is distrust in government and the other extreme is a high trust in government. A dimension has at least two opposing topics, (i.e. denoting the extremes) and can contain further topics along the scale.

eAdministration covers the deployment of modern ICT in the public sector administration in order to make the performance and management of business operations more efficient and effective. When talking of *eGovernment* in the past, thought was given to eAdministration. The main focus was delivering more effective government, providing information and services, e.g. building applications, social services, tax computations, etc. Information and services should be available over several different communication channels like telephone, Internet or *one stop government* shops. Research and modernisation was concentrated on the better design of *front office* and *back office* structures and the modernisation and redesign of administrative procedures. The term of "virtual town halls" implied spreading accessibility through Internet portals.

eDemocracy describes the (technical and organisational) modernisation and support of political and democratic processes with innovative information and communication technology. Concepts and solutions focus on proper methods and access channels to communicate and to take active part in participative processes (*eParticipation)* and voting *(eVoting)* using ICT.

Effectiveness is the extent to which an organisation or programme accomplishes its mission, goals, and objectives, especially from the perspective of key stakeholders. It is part of the three 'E's (Economy, Efficiency and Effectiveness). If Economy means 'spending less' (reduce input), and Efficiency 'spending well' (more output for a given amount of input), Effectiveness is 'spending wisely', that is use input in such a way as to maximise the likelihood of achieving a maximum outcome.

eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterises not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.

eLearning encompasses all forms of teaching and learning based on information and communication technology and thus extends traditional methods of knowledge transfer. eLearning allows interactive, multimedia-based, cooperative and individual learning without spatio-temporal restrictions.

Electronic public services -> eServices

Environment [in eGovRTD2020] is a dimension which indicates that the future can either be stable or disruptive. A stable environment can be characterised by economic growth, a balanced world order, living in harmony, prosperity and welfare. Whereas in a disruptive environment all kinds of crises, terrorism attacks, cyber wars and other types of unexpected incidents occur. Also, religious tensions and a large social divide exist in an instable or disruptive environment.

eParticipation develops and implements forms of participation in decision and policy-making processes for citizens based on the extensive use of information and communication technology. eParticipation thereby spans information provision about democracy matters, top down engagement of citizens (governments and politicians consult and engage citizens in democracy matters), as well as bottom-up empowerment (citizens get active in engaging in political decision-making matters) thereby using available ICT. The ultimate goal of eParticipation is to improve *transparency*, inclusiveness (-> *digital divide*) and *accountability* in decision-making (of democracy and state).

ePayment is a generic term for systems and processes concerning the electronic transmission of data in relation to payments of goods and services over a network (Internet, UMTS etc.). Different ePayment mechanisms exist, with wide variation in the quality of secure data transmission.

eProcurement refers to an organisation's process of procuring goods and services online, for example via the Internet. The buyer and seller optimise the whole value chain of acquisition, negotiation, order and delivery of goods and services thereby exploiting advanced information and communication technology facilities, and reducing costs, effort and delivery times.

eServices is a generic expression for services which are handled and delivered electronically.

eVoting includes both electronic means of casting a vote and electronic means of counting votes (part of *eDemocracy).* It describes different ways of electing and voting by the use of information and communication technology. Online networks, including the Internet, could be used to provide voting facilities away from traditional polling places. Apart from enabling democratic participation of citizens, eVoting also covers other forms of expressing one's opinion, for example common voting on a web page.

Front-office refers to a set of application programmes and (virtual or physical) access points that enable direct contact between customers and service providers. In eGovernment, these include web portals, offices for citizens' contact, and call centres where citizens get information about public services. Apart from the information itself, direct invocation of services and full interaction along the service value chain may be provided.

Gap [in eGovRTD2020] is defined as a mismatch between the issues (dimensions or topic of interest) in the state of play and future scenarios, or a lack of recognition of issues that are not in the state of play but required in the future scenarios.

Gap storylines [in eGovRTD2020] are a coherent collection of issues (dimensions and topics of interest) within one category including a problem, a goal and potential solutions in the future. Storylines may enlarge issues of scenarios with new aspects to make them internally complete and consistent.

Good governance is a concept that describes the principles, approaches and guidelines for steering and managing an organisation. In the public sector, it refers to public administrations promoting interaction and formation of political will with regards to societal and technological changes. The European Commission has formulated five principles for "good governance": *openness*, *participation*, *accountability*, *effectiveness* and *coherence*.

Harmonisation describes the way of converging existing (organisational, semantic or technical) systems towards a seamless point of intersection.

Holistic view [in eGovRTD2020] refers to a framework of considering eGovernment as being shaped and influenced by different factors in a comprehensive and intertwined way.

Identification (biometric; digital identity) is the process of providing the essentials of a person's (digital) identity (name, biometric characteristics such as fingerprint, iris scan, DNA, etc.). Depending on the process and service, different qualities of identity of a person may be used. Biometric identification is a process of using biometric characteristics of a person to identify him or her.

Identity management is the process of managing, providing and using identities, especially digital identities. It enables a user to use different identities based on the circumstances and requirements of an electronic process (-> *Identification*). Systems used for identity management provide functionality for the *authentication*, password management, access management and management of rights and resources of single users.

Inclusion, socio-economic, also referred to as simply 'social inclusion', is a 'reactive' concept that cannot be defined without first defining its opposite, namely social exclusion. Social exclusion is used to generally indicate processes and structural arrangements producing the marginalisation and alienation within a given society. Social exclusion comprises many dimensions (social, economic, cultural, relational and political) that, when interacting and being summed up, produce the disenfranchisement and total lack of broadly defined social participation on the side of individuals and/or social groups. It is usually relates to individuals' social class, educational status and living standards, but also increasingly to disabilities, ethnic and race identity and positioning, age (elderly people), gender. All these features have an impact on individuals' access to various opportunities. Social inclusion is the other side of the coin. It mostly refers to policies and affirmative actions that aim at changing the structural situations and the individual attitudes leading to social exclusion.

Information architecture is a component of an organisation's enterprise architecture and refers to a snapshot of an organisation's systems and information landscape. Thereby the interdependencies and information flows among system components, and the interfaces between them are described.

Information overload describes the circumstance where too much information is available and provided, and due to this overload, the right information cannot be identified and/or accessed quickly any more.

Information Society describes an economic system and a form of society which is heavily influenced by, and based on information and communication technology. The attaining, storing, processing, spreading and use of information and knowledge plays an essential role in all areas of life.

Intelligent agents are pieces of software, which assist users in a wide range of applications by acting independently, and in the background, to perform computer-related tasks. A personalised daily news ticker can be seen as a simple example of an intelligent agent.

Interoperability (organisational, semantic, and technical) in the public sector refers to a smooth interaction of heterogeneous systems, independent organisations and people, and different information with no need to develop specific point-to-point interfaces and agreements. Interoperability can be addressed at organisational, semantic and technical levels in order to allow socio-technical systems to interoperate smoothly. Organisational interoperability refers to common agreements of working together and enabling systems to exchange data and processes, including processes across organisations. Semantic interoperability refers to common understanding as well as shared interpretation of processes, content and data. Technical interoperability is concerned with technical means to secure smooth interoperation across heterogeneous systems. Examples are common data standards and communications protocols or standard data formats.

Issues [in eGovRTD2020] are aspects/elements in a scenario. A scenario combines various issues of a future vision of eGovernment. An issue can be either a *dimension* or *topic of interest*.

Knowledge management refers to a range of activities and systems support functions to govern the information and knowledge in an organisation, or in a specific context. Knowledge management processes include the efficient identification, storage, processing, distribution and usage of information and knowledge.

Lean government describes a concept to reform a government including its organisational and operational structure by e.g. flattening hierarchies, reducing bureaucracies, reengineering and reducing service portfolios, as well as minimising manual work. Often, lean government refers to the steering and governing of public administration duties, while effective and efficient services are provided by being outsourced to the private and civic sectors.

Life-event concept refers to a structuring principle of online public services along life-events to meet citizens needs and provide ways of searching for information of these events (e.g. birth of a child, marriage, etc.). All relevant information and service offerings of public administration with regard to specific life circumstances are virtually integrated and interlinked in *one single point of access*. This substantially increases the service-orientation of public authorities. The life event concept is especially useful in *one-stop government* concepts.

Metadata are structured data, which contain information about other data and thereby describe data. For instance, the metadata attributes of electronic documents are detailed by author, right of access, date of the last processing, format and keywords. This makes the retrieval, administration and management of electronic resources substantially easier.

Mobile government is the extensive use of mobile technologies, channels and devices in connection with *eGovernment*. The term also includes the transaction of business processes over wireless networks and mobile devices like laptop computers, mobile phones or PDAs (personal digital assistants). The goal is to provide location-independent access to existing and new services, applications and information for the citizens, companies and public authorities.

Networked governments refer to the concept of governments being fully inter-linked with their partners and constituencies via modern ICT in order to fulfil their public duties. A key precondition thereby is full *interoperability* at all levels.

New public management is the generic term for internationally discussed reform and modernisation approaches for public authorities. The focus of such concepts lies in the adoption of management concepts, theories and instruments as used in the private sector to increase the effectiveness, efficiency and orientation towards the citizen, and with the intention of increasing *public value*.

One-stop government describes a concept with a single point of access to electronic services and information offered by different public authorities. Online one-stop Government requires public

authorities to be fully networked (-> *networked governments*). The users of one-stop Government are able to access the *eServices* offered in a well structured and understandable manner (-> *life-event concept*) meeting his/her perspectives and needs. See also -> *Single access point*

Openness refers to the quality of an organisation, programme or society which encourages broad participation and multiple view points, and accepts new ideas and external influences.

Participation *-> eParticipation*

Policy formulation is the process of developing and defining policies, making strategic decisions, formulating and enacting laws, issuing constitutions of states, and so on.

Policy implementation (enforcement, execution) is the operative level in regards to *policy formulation*, where the policies formulated are being executed, such as intervening in society and market. It refers to the core business of operative action in governments.

Privacy refers to aspects of the private sphere or personal data of an individual or a group. Privacy protection is concerned with keeping an individual's or group's personal and private affairs out of public view.

Public sector is the part of an organised society concerned with the *policy formulation*, *policy implementation*, and *(good) governance* of that society and the market as a whole with the purpose of enabling a smooth and secure life in society, economic growth, and welfare.

Public value is an abstract term for describing the benefits and contributions of *public sector* activities to the society's welfare and growth. Unlike in the business sector, the costs and benefits of public sector activities often cannot be measured in profit or loss. Instead, government activities contribute to the public welfare (give added value to the society). In a general understanding, public value measures the value-add that public organisations bring to individual citizens, society and the market via the public services thereby indicating how effectively taxpayer money is spent.

RFID (Radio Frequency IDentification) is a data collection technology that uses electronic devices (chips) for storing data permanently, for example in a smart card, and radio frequency mechanisms to read / extract the data from the chips when needed.

Roadmap [in technology roadmapping] refers to an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drivers of change in that field. Roadmaps communicate visions, attract resources from business and government, stimulate investigations, and monitor progress. They become the inventory of possibilities for a particular field. Consequently, a roadmap [in eGovRTD2020] is a collection of paths describing a set of themes and measures to achieve desirable parts of the future and to avoid unwanted parts. The roadmap is based on *categories* and *dimensions*, extracted from the *scenarios*, and on the *gaps* ranked as highly relevant in the gap analysis. The *categories* and *dimensions* from the scenarios may correspond to the *eGovernment* research themes.

Scenario [in eGovRTD2020] is an internally consistent and coherent sketch of a future vision of *eGovernment*. **Scenarios** are archetypal images of the future, developed through interpretations of the current reality.

Semantic web is designed to upgrade today's Internet (WWW) with machine readable data extended with computer-processable meaning (semantics). *Metadata* stores information on web content (knowledge objects) in such a way that machines are able to read and process it. The goal is to support humans in the search, management and maintenance of available data on the Internet.

Single access point describes the concept of one unique entry point to government services from a wide range of different public agencies. See also -> *One-stop Government*

Socio-technical system in the context of eGovernment refers to considering public administration made up of people (the social system) using tools, techniques and knowledge (the technical

system) to produce public services valued by the governments' constituency (external to the public administration).

State of play [in eGovRTD2020] describes the current stage and status of eGovernment implementation in the project's participating countries. It is likely that each implementation is in the state of flux.

Topics of interest [in eGovRTD2020] are single points along a dimension and are a particular type of issue. One topic of interest can belong to more than one dimension. For example, the trust dimension can contain certification authorities as a topic of interest. A certification authority can also belong to the security dimension.

Transparency refers to an aspect of government activity where the customer (e.g. citizen or business) knows at any time what is happening and what comes next in the interaction with a government agency. Transparency is strongly related to *trust*, *privacy* and *data protection*. I.e. transparency is a precondition to establish trust. Privacy and data protection require transparency in the handling of private, sensitive data in order to secure trust.

Trust is the degree to which citizens and other groups in society believe they will be treated fairly. It includes the degree to which people and organisations believe they can rely on the motives, and predict the performance, of others.

Usability is the degree to which users are able to use a system with the skills, knowledge, stereotypes and experience they can bring to bear.

Value chain categorises the generic value-adding sequence of activities of an organisation.

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Dr. René W. Wagenaar (1954 - 2007), Professor and Chair of the ICT section at Delft University of Technology, Faculty of Technology, Policy and Management. Over 15 years of experience in the ICT sector, in various positions in the academic and industrial communities. René worked with great enthusiasm at building high quality education and research programmes at the crossroads of ICT, policy and management. He has passed away unexpectedly on Sunday, February 25, 2007, during a short vacation in Switzerland.

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In memoriam
René W. Wagenaar (1954 - 2007)

It is with great sadness that Prof. Dr. René Wagenaar, Professor of Information and Communication Technology and Head of the Department of Information and Communication Technology of Delft University of Technology has passed away unexpectedly on Sunday, February 25, 2007, during a short vacation in Switzerland.

With professor Wagenaar, we lost a very competent colleague with over 15 years of experience in the ICT sector, business, and government. After his university study and promotional research in experimental physics, he began his career in ICT as a computer network architect at Philips Data and Telecommunications Systems in the Netherlands and Sunnyvale, USA. After a brief period as a university lecturer with the ICT group of the Faculty of Economics at Erasmus University in Rotterdam, in 1989 he moved on to the Faculty of Management where he started working as an associate professor in Business Telecommunications. Under his leadership new research was set up into the impact of electronic communication and EDI within trade and transport chains, which resulted in a large number of publications. In addition, he developed the concept for the management simulation game called "Port of Rotterdam", which became very popular in the business community. In 1996 he moved to KPN, and at the same time was appointed to a special chair "Teleservices, in particular their economic aspects" at the Free University of Amsterdam. Within KPN he filled the staff position of corporate R&D strategy, where he was especially involved in the development of new eBusiness concepts and services.
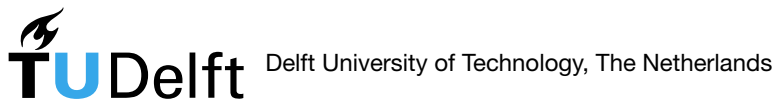
Since his appointment at the Faculty of Technology, Policy and Management (TPM), in October 2001, René worked with great enthusiasm at building a dynamic ICT section and high quality education and research programmes at the crossroads of ICT and government. His personal fields of interest included issues of technological innovation, organisational redesign, eGovernment and management. He was also very active internationally, e.g. in setting up the European eGovernment Society, and in eGovRTD2020. René was a close friend and collaborator of all of us. He acted as an important motivator and sounding board. In short, René was a researcher of international standing and we were very happy to have him on board.

We were completely surprised by René's passing away. Only a few days before we have had a project meeting in Delft and we had the pleasure to have profound discussions about synthesising the roadmapping results into a final roadmap towards eGovernment in 2020. At that time he was full of energy and had great ideas which we were planning to explore. His death represents a great loss to the project and the research community. It is not only for his expertise and professional qualities that René will live on in our memories. We will also remember him as an inspired researcher, a fine colleague with loyalty and integrity, and a warm personality who enjoys discussing research.

In this time of personal loss our thoughts are especially with Brenda, Joris and Nils, who now face life without their proud husband and father. They have lost a pillar of their close family. We wish them much strength.

The eGovRDT2020 project partners.

eGovRTD2020 Project Consortium

UNIVERSITÄT KOBLENZ · LANDAU — University of Koblenz-Landau, Germany (Coordinator)

TUDelft — Delft University of Technology, The Netherlands

CeTIM — Center for Technology and Innovation Management, Germany

Mykolas Romeris University, Lithuania

UNIVERZA V MARIBORU — University of Maribor, Slovenia

Institut Européen d'Administration Publique — Centre Européen de Formation dans les Affaires Sociales et de Santé Publique (IEAP-CEFASS) European Institute of Public Administration — European Training Centre for Social Affairs and Public Health Care (EIPA-CEFASS) — European Institute of Public Administration - European Training Centre for Social Affairs and Public Health Care, Italy

SIG — Systèmes Informatiques de Gestion, France

ANU — The Australian National University, Australia

Center for Technology in Government — Center for Technology in Government, University at Albany, USA