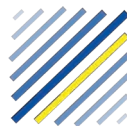




A Green Knowledge Society

An ICT policy agenda to
2015 for Europe's future
knowledge society



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An ICT policy agenda to 2015 for Europe's future knowledge society

A study for the Ministry of Enterprise, Energy and Communications,
Government Offices of Sweden

by SCF Associates Ltd

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The opinions expressed in this study are those of the authors and do not necessarily reflect the views of the Ministry of Enterprise, Energy and Communications, or any of the individuals or organisations consulted in the course of the study

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Foreword

Pushing the envelope for the information society, towards a knowledge society

ICTs are contributing substantially to growth and jobs in the EU and beyond. The benefits of using ICTs in work and everyday life are evident. Its importance for social and cultural participation everywhere is increasing dramatically.

This influence is key for continued progress and prosperity.

There is a call for a radical transformation towards a European knowledge-based society in order to further develop and reap the benefits of ICTs. For me, this translates to expanding the frontier of the information society, to embrace the full potential of the knowledge society. Doing that will help us meet the challenges of our time: we need to keep working on how to make Europe the most dynamic and competitive knowledge-based economy, and in so doing, transform it to an eco-efficient one.

Pushing the envelope for the information society is about enabling structural change. That is how radical the transformation is.

Already today we can see clear indications of transformation. Technologies and applications that are spearheading the development of the information society are challenging established institutions and business models.

Can we expect structural change and radical transformation to be smooth and painless? I think not. History abounds with examples of dramatic change that brought costs for a few but great gains for many more.

What is the role of governments in this structural change?

Governments have a choice of enabling or resisting change.

We tend to speak lightly on structural change, as if there was no price to pay or no choice to make.

When the time comes to implement the abstract and macro-level speeches on change, it is all about real-world actions. Often this is when good intentions and a desire to evolve grinds to a halt.

There is no way around it if we seriously aim for a European knowledge society. We should take advantage

of ICTs to pre-empt unnecessary change, such as excessive urbanisation or increased load on the environment. But we should prepare for justified structural change and be fair and firm in dealing with conservative forces and in how we meet the needs of people that are negatively affected.

Before the start of the Swedish Presidency we commissioned this study to bring to the fore what ICT-related policy issues will become important in the years ahead.

I call upon the Member States to take note of the areas and issues suggested by the study team in this report. I look forward to discussions about a future EU ICT-policy, first as a broad and public debate and later at the conference *Visby Agenda – creating impact for an eUnion 2015* on November 9 and 10, to which I am inviting Member States, the Commission and stakeholders in the future European knowledge society.

Our common task is to shape the ICT strategy for Europe. I welcome you to participate and truly hope that we will be frank and fearless in our work in this important area.



Åsa Torstensson

Minister for Communications



Executive Summary

The European Union is undergoing a profound transformation, in moving from an industrial to a knowledge-based society

This report aims to facilitate the debate on the best ICT policy for this future

The European Union is undergoing a profound transformation from its two-century old industrial past to a knowledge society future.

Information and communication technology (ICT) now permeates virtually all aspects of our lives. ICT is inextricably linked with our desire for a prosperous and competitive economy, a sustainable environment, and a more democratic, open, healthy society. ICT should be seen as a key positive element, empowering EU citizens, growing businesses, and helping us build an open, innovative, secure and sustainable knowledge economy. Moreover, the knowledge society envisaged here is based on respecting human rights. It is an inclusive and open society, maintained by a globally competitive, green economy of sustainable growth.

The Ministry of Enterprise, Energy and Communications commissioned this report as part of its contribution to facilitating the ongoing debate on ICT policy. The study was therefore designed to identify the most important policy questions that the EU faces with regard to ICT and the information society to around 2015. Overall the report seeks to:

- Provide a general focus for discussion of ICT policy in Europe, at a Swedish Presidency conference in November, with an analysis of the current situation, trends, developments and their potential consequences for the citizen, and for EU companies and governments, highlighting the key issues.
- Project forward the i2010 policy issues, seeking to update and identify new policy questions facing the EU up to 2015.
- Identify promotional and catalytic actions needed for delivery of a sustainable knowledge society.

A vision of a green knowledge society

In essence the report addresses the question of how we can further the development of a European knowledge society in practical terms. The report opens with a vision of the social and economic advantages to the EU of a balanced application of ICT in the long term, starting immediately and going beyond 2015. The major gains from change will come when digital technology has become almost mundane, as it is integrated into daily life. It will create new societal forms and bases for the EU economy.

But how can we manage and plan all this? Europe needs a clear, balanced ICT policy based on a full understanding of the policy issues and of the context in which they are addressed. A pragmatic strategy is needed for sustainable growth and prosperity so that Europe can respond to the main challenges ahead which include:

- Transforming Europe into the high skill/high employment economy needed in a globalised environment.
- Tackling the effects of an ageing population while improving the major services for the public.
- Doing so in a way that takes account of foreseeable public expenditure and environmental constraints.

Three themes govern ICT policy as outlined here – social impacts; the need for a economic prosperity in terms of jobs, revenues and national budgets; addressing climate change in meaningful ways

In essence the report addresses the question of how we can further the development of a European knowledge society in practical terms

Ten key policy areas have been identified to give Europe a clear, balanced ICT policy with a broad view of all the issues, in order to guide progress in the twenty first century

Policy themes

Three key themes run through this policy study:

First, ICT is bringing about a fundamental shift in our economic and social lives. For instance, relationships between producers and consumers in both public and private spheres become more interactive and multi-faceted, so that the consumer ceases to be just a passive recipient and becomes an active participant. There are enormous consequences for the ways in which we interact, our social organisation, the delivery of public services including how government interacts with citizens. This means we must be ever more aware of human and social aspects as they relate to ICT. The critical importance of this was recently highlighted by EU President Barroso, who recently called for ‘a Europe committed to the radical transformation towards a knowledge-based society’.

Second, we have reached a tipping point in the transition to a knowledge economy. The changes we have been experiencing can no longer be thought of as an evolution from the industrial past. Rather, the change is revolutionary. The enterprises that drive the knowledge economy and produce jobs and growth have to be more competitive, creative and innovative than ever before. It is crucial that Europe becomes a leading knowledge economy if it is to meet the social and economic aspirations of its citizens. Moreover, the current economic downturn emphasises an immediate objective for ICT policy, to be an element for economic recovery and strengthen the European economy. Commissioner Reding has highlighted this potential in recent speeches.

Third, the issue of climate change is the most important challenge of our time. ICT occupies a leading role in the fight against climate change, contributing to a sustainable low-carbon economy. Moreover a global lead in this domain could be an important new opportunity segment for Europe’s economy – a ‘Green New Deal’.

A practical plan for the green knowledge society

These three themes emerged from the study’s programme of research and interviews with experts and stakeholders. These themes underpinned the selection of ten key policy areas, which were chosen from the analysis of interviews and a creative workshop with leading thinkers. The ten policy areas, shown below, form an overall ICT policy framework for the EU over the next five to ten years:

1. The knowledge economy: driver of future wealth
2. The knowledge society: participation for all
3. Green ICT: support for an eco-efficient economy
4. Next generation infrastructure: balancing investment with competition
5. Soft infrastructure: investing in social capital
6. SMEs and ICT: supporting Europe’s small enterprises
7. A single information market: enabling cohesion and growth
8. Revolutionising eGovernment: rethinking delivery of public services
9. Online trust: a safe and secure digital world
10. Clear leadership: rethinking the EU’s policy making process

These policy areas are discussed in detail in the report. For each area, the main issues and the broad policy goals up to 2015 have been identified, together with policy actions designed to achieve them. A selection of the more important of these goals and actions for the ten policy areas is set out below:

Policy area	Policy goals for 2015	Policy actions
<i>1. The knowledge economy: driver of future wealth</i>	<ul style="list-style-type: none"> • Improved ICT training • New IPR regime for the digital era • User involvement in innovation 	<ul style="list-style-type: none"> • Facilitate new business models • Build consensus on new IPR approach • Expand concepts of end user participation and creativity
<i>2. The knowledge society: participation for all</i>	<ul style="list-style-type: none"> • Inclusion with universal access • Improve digital literacy • Better support for older people 	<ul style="list-style-type: none"> • Incentives to extend networks and take-up • Strengthen human rights in a digital world
<i>3. Green ICT: support for an eco-efficient economy</i>	<ul style="list-style-type: none"> • Create green ICT products & services markets • Understand and exploit substitution mechanisms • Harness ICT in non-ICT sectors 	<ul style="list-style-type: none"> • Explore financial incentives • Extend/use government procurement • Research into household and firm behaviour • R&D support for novel control systems
<i>4. Next generation infrastructure: balancing investment with competition</i>	<ul style="list-style-type: none"> • Maintain competition in all ICT sectors • Promote open source software and open standards • Transparent internet governance • Promote (fixed and wireless) high speed broadband networks 	<ul style="list-style-type: none"> • Vigorously deploy competition law with accelerated processes • Encourage open ICT, networks and standards • Inclusive approach to internet governance • Harmonise EU spectrum policy • Balance investment incentives and access rights for networks
<i>5. Soft infrastructure: investing in social capital</i>	<ul style="list-style-type: none"> • Set up a build-and-rollout programme for each service (ie eHealth, eEducation, etc) • Ensure investments stimulate EU economy • Use green ICT 	<ul style="list-style-type: none"> • Identify key candidates for services and create a vision for the whole soft infrastructure, Europe-wide • Develop business cases • Fund design, pilot and roll-out
<i>6. SMEs and ICT: supporting Europe's small firms</i>	<ul style="list-style-type: none"> • Expand / deepen ICT use through broadband, cloud computing, etc • Support small firms with potential for innovation and growth • More support for rural SMEs 	<ul style="list-style-type: none"> • Build competency in small firms with growth potential • Raise awareness and improve digital literacy • Grants for expert advice • Deploy rural development and other funds
<i>7. A single information market: enabling cohesion and growth</i>	<ul style="list-style-type: none"> • Demonstrate the economic gains • Harness knowledge economy and green ICT • Simplify regulation 	<ul style="list-style-type: none"> • Promote advantages • Encourage single market in public services • Prepare deregulation packages appropriate to each segment
<i>8. Revolutionising eGovernment: rethinking delivery of public services</i>	<ul style="list-style-type: none"> • Citizens as participants rather than just tax payers • Increase participation levels across Member States 	<ul style="list-style-type: none"> • Spread best practice in participatory eGovernment • Benchmark citizens' participation • Establish open platforms for developing services
<i>9. Online trust: a safe and secure digital world</i>	<ul style="list-style-type: none"> • Overcome organisational issues • Improve protection of critical ICT infrastructure • Protect individuals' rights • Safety and reliability online for all 	<ul style="list-style-type: none"> • Increase awareness • Plan for implementation • Enhance EU co-ordination • Protect the citizen online
<i>10. Clear leadership: rethinking the EU's policy making process</i>	<ul style="list-style-type: none"> • European institutions develop clear vision of role of ICT • Realistic stretch targets for key policy areas 	<ul style="list-style-type: none"> • Enhance levels of collaboration • Review institutional structures • Stronger links to other policy areas, such as the environment

Synthèse

L'Union Européenne traverse une profonde transformation et est en train de passer d'une société industrielle vers une société de la connaissance.

Ce rapport a pour objectif de faciliter les débats sur la meilleure politique à appliquer dans le futur, pour les TICs.

En substance, le rapport aborde la question de savoir comment pouvons-nous, en termes pratiques, favoriser le développement d'une société de la connaissance européenne.

L'Union Européenne traverse une profonde transformation. Son passé industriel démarré au 19^e siècle, évolue pour aller vers une société future axée sur la connaissance.

Les technologies de l'Information et de la communication (TIC), imprègnent aujourd'hui quasiment tous les aspects de notre vie. Elles sont inextricablement liées à notre désir d'une économie prospère et compétitive, d'un environnement durable, et d'une société plus démocratique, plus ouverte, et en bonne santé.

Les TIC devraient donc être considérées comme un élément positif majeur dont les bénéfices seraient de donner davantage de pouvoir aux citoyens de l'Union Européenne, d'accroître la croissance des entreprises, et de nous aider à bâtir une économie ouverte et innovante, sûre et durable, basée sur la connaissance. De plus, la société de la connaissance imaginée ici est fondée sur le respect des droits de l'homme. Il s'agit d'une société inclusive et ouverte, maintenue par une croissance durable liée à une économie verte et une concurrence internationale.

Le ministère de l'Entreprise, de l'Energie et des Communications a commandé ce rapport dans le cadre de sa contribution à faciliter les débats en cours sur les politiques liées aux TIC. L'étude a donc été conçue pour identifier les questions les plus importantes auxquelles l'UE est confrontée en matière de TIC et sur la société de l'information jusqu'en 2015.

Globalement, le rapport vise à :

- Fournir une orientation générale pour l'examen des politiques des TIC en Europe, lors d'une conférence présidée par la Suède en Novembre, avec une analyse de la situation actuelle, des tendances, des évolutions et leurs conséquences éventuelles pour le citoyen, pour les entreprises de l'UE, et les gouvernements, soulignant ainsi les points essentiels.
- Prévoir les questions et les enjeux politiques liés au projet i2010 et en imaginer les évolutions auxquelles l'UE devra faire face jusqu'en 2015.
- Identifier les mesures nécessaires pour promouvoir et déclencher des actions en vue d'atteindre une société de la connaissance durable.

La vision d'une société de la connaissance verte

En substance, le rapport aborde la question de savoir comment pouvons-nous favoriser le développement d'une société européenne de la connaissance, en termes pratiques. Le rapport débute sur une vision des avantages sociaux et économiques pour l'UE d'une mise en application équilibrée des TIC sur le long terme, en commençant immédiatement et en allant bien au-delà de 2015. Les bénéfices majeurs du changement viendront lorsque la technologie numérique sera devenue presque banalisée, et intégrée dans notre vie quotidienne. Elle créera ainsi de nouvelles formes de société et les fondements d'une économie européenne.

Mais comment pouvons-nous gérer et planifier tout cela ? L'Europe a besoin d'une politique équilibrée et claire fondée sur les TIC et basée sur la parfaite compréhension des questions politiques et du contexte dans lesquelles elle s'applique. Une stratégie pragmatique

Trois thèmes régissent la politique des TIC, comme indiqué ici : les impacts sociaux, la nécessité d'une prospérité économique en termes d'emplois, de revenus et des budgets nationaux; et la lutte contre les changements climatiques de façon significative

est nécessaire pour une croissance et une prospérité durables afin que l'Europe puisse répondre aux principaux défis à venir, dont:

- **La transformation de l'Europe en une économie du plein emploi et qualifié, nécessaire dans un environnement mondialisé.**
- **La lutte contre les effets du vieillissement de la population tout en améliorant les principaux services pour le public.**
- **Et la réalisation tout cela en tenant compte des dépenses publiques prévisibles et des contraintes environnementales**

Les thèmes politiques

Trois thèmes clés sont les fondements de cette étude :

Tout d'abord, les TIC sont la base d'un changement fondamental dans notre vie économique et sociale. Par exemple, les relations entre les fournisseurs et les consommateurs dans les sphères publiques et privées deviennent plus interactifs et multi-facettes. Ceci afin que le consommateur cesse d'être un simple acteur passif et devienne un participant actif. Les conséquences sur notre façon de communiquer, notre organisation sociale, les prestations des services publics, y compris sur la manière dont le gouvernement interagit avec les citoyens, sont énormes.

Cela signifie que nous devons être conscients en permanence des aspects humains et sociaux qui ont trait aux TIC. L'importance cruciale de ce point a été récemment soulignée par le président Barroso de l'UE, qui a appelé pour que l'«Europe s'engage pour une transformation radicale vers une société de la connaissance».

Deuxièmement, nous avons atteint un point crucial en matière de transition vers une économie de la connaissance. Les changements que nous avons connus ne peuvent plus être considérés comme une évolution du passé industriel. Au contraire, le changement est révolutionnaire. Les entreprises qui mènent l'économie de la connaissance et créent des emplois tout comme de la croissance, doivent être plus compétitives, créatives et innovantes que jamais. Il est primordial que l'Europe devienne une économie leader dans le domaine du savoir, si elle veut répondre aux aspirations sociales et économiques de ses citoyens. En outre, le ralentissement économique actuel met l'accent sur un objectif immédiat lié à la politique sur les TIC. Il s'agit d'être un élément actif pour la relance économique et le renforcement de l'économie européenne. Mme Reding a souligné ce potentiel dans de récents discours.

Troisièmement, la question du changement climatique est le défi le plus important de notre temps. Les TIC jouent un rôle de premier plan dans la lutte contre le changement climatique, et contribuent ainsi à une économie durable, à faibles émissions de carbone. En outre, être un chef de file mondial dans ce domaine pourrait faire naître un secteur offrant de nouvelles opportunités pour l'économie européenne - un «Green New Deal» ou une «Nouvelle Donne Verte»

Un plan réalisable pour une société de la connaissance verte

Ces trois thèmes sont le fruit d'un programme d'étude et de recherche couplé à des interviews d'experts et d'intervenants. Ils sont la base de la sélection de dix domaines d'action clés, qui ont été choisis à partir de l'analyse des interviews, et d'un atelier de création avec de grands penseurs. Les dix domaines d'action, présentés ci-dessous, forment une

Dix domaines d'action clés ont été identifiés afin de doter l'Europe d'une politique claire et équilibrée en matière de TIC avec une vue panoramique de toutes les questions, visant à établir des lignes directrices pour progresser au cours du XXI^e siècle

structure globale pour une politique sur les TIC à destination de l'UE pour les cinq à dix prochaines années:

1. L'économie de la connaissance : l'action principale pour une future richesse
2. La société de la connaissance: une participation pour tous
3. Les TIC vertes: le soutien à une économie éco-efficace
4. Une Infrastructure de nouvelle génération: pour un équilibre entre investissement et concurrence
5. Infrastructure souple: afin d'investir dans le capital social
6. PME et TIC: le support pour les PME européennes
7. Un marché unique de l'information: pour permettre la cohésion et la croissance
8. Révolutionner l'administration en ligne: afin de repenser la prestation des services publics
9. Confiance en ligne: pour un monde numérique sécuritaire et sécurisé
10. Des directives claires: afin de repenser la politique de l'UE en termes de processus

Ces domaines politiques sont examinés en détail dans le rapport. Pour chaque d'entre eux, les principaux enjeux et les objectifs politiques globaux à l'horizon 2015 ont été identifiés, ainsi que des actions politiques visant à les atteindre. Une sélection des plus importants de ces objectifs et d'actions pour les dix secteurs de la politique est énoncée ci-dessous:

Domaine politique	Objectives politiques 2015 pour la politique	Actions politiques
<i>1. L'économie de connaissance : une source de richesse pour le futur</i>	<ul style="list-style-type: none"> • Amélioration de la formation en TIC • Nouveau régime des droits d'auteur et des brevets dans le monde numérique • Participation des utilisateurs aux innovations 	<ul style="list-style-type: none"> • Faciliter les nouveaux modèles d'entreprises • Bâtir un consensus sur une nouvelle approche liée aux droits d'auteur et de brevets • Développer des concepts de participants des utilisateurs finaux et de création de valeur
<i>2. La société de connaissance : une participation pour tous</i>	<ul style="list-style-type: none"> • Intégration avec accès universel • Amélioration des compétences et connaissances des technologies numériques • Meilleure prise en charge des personnes âgées 	<ul style="list-style-type: none"> • Incitations à étendre les réseaux et à les utiliser • Renforcer les droits de l'homme dans un monde numérique
<i>3. Les TIC vertes : le soutien à une économie éco-efficace</i>	<ul style="list-style-type: none"> • Création de produits TIC « verts » et de marchés de services • Comprendre et exploiter des mécanismes de substitution par les TIC • Exploiter les TIC dans les secteurs non TIC 	<ul style="list-style-type: none"> • Examiner les incitations financières • Étendre l'utilisation des marchés publics • Recherche sur les comportements des ménages et des entreprises • Support de la R&D pour les nouveaux systèmes de contrôle.
<i>4. Une infrastructure de nouvelle: pour un équilibre entre investissement et concurrence</i>	<ul style="list-style-type: none"> • Maintenir la concurrence dans tous les secteurs des TIC • Promouvoir les logiciels libres et les standards ouverts • Gouvernance Internet • Promouvoir les réseaux larges bandes à haut débit (fixe and sans fil) 	<ul style="list-style-type: none"> • Déploiement fort des droits de la concurrence via des processus accélérés. • Encourager l'utilisation des TIC, des réseaux et des standards ouverts • Approche inclusive de la Gouvernance de l'Internet • Harmoniser l'éventail politique de l'UE • Equilibrer les incitations à l'investissement et les droits d'accès aux réseaux

<i>5. L'infrastructure douce : afin d'investir dans le capital social</i>	<ul style="list-style-type: none"> • Mettre en place un programme de construction et de déploiement pour chaque service (par exemple: l'e-Santé, l'e-Education...) • Veiller à stimuler les investissements de l'économie de l'UE • Faire appel aux TIC vertes 	<ul style="list-style-type: none"> • Identifier les principaux candidats pour les services et créer une vue globale de l'ensemble de l'infrastructure, à l'échelle de l'Europe. • Développer des cas utilisateurs • Mettre en place des fonds, des pilotes et des déploiements
<i>6. Les PME et TIC : le support pour les petites entreprises européennes</i>	<ul style="list-style-type: none"> • Développer et renforcer l'utilisation des TIC dans les réseaux large bande, l'informatique des nuages... • Soutenir les PME à fort potentiel en termes d'innovations et de croissance • Renforcer le support aux PME rurales 	<ul style="list-style-type: none"> • Mettre en œuvre des compétences au sein des PME à fort potentiel de croissance • Sensibiliser et améliorer la culture numérique • Attribuer des subventions pour des conseils d'experts • Déploiement du développement rural et d'autres fonds.
<i>7. Un marché unique de l'information : pour permettre la cohésion et la croissance</i>	<ul style="list-style-type: none"> • Faire la démonstration des gains économiques • Exploiter l'économie de la connaissance et des TIC vertes • Simplifier la réglementation. 	<ul style="list-style-type: none"> • Promouvoir les bénéfices • Favoriser le marché unique pour les services publics • Préparer la déréglementation des lots appropriés à chaque segment
<i>8. Révolutionner l'administration en ligne : afin repenser les prestations des services publics</i>	<ul style="list-style-type: none"> • Considérer les citoyens en tant que participants plutôt qu'en tant que contribuables • Augmenter les niveaux de participations des Etats membres 	<ul style="list-style-type: none"> • Diffuser les meilleures pratiques en matière de e-gouvernement • Evaluer la participation des citoyens • Mettre en place des plateformes ouvertes pour le développement de services
<i>9. Confiance en ligne : pour un monde numérique sécuritaire et sécurisé</i>	<ul style="list-style-type: none"> • Surmonter les problèmes organisationnels • Améliorer la protection des infrastructures critiques des TIC • Protéger les droits de l'individu • Assurer la sécurité et la fiabilité en ligne pour tous 	<ul style="list-style-type: none"> • Accroître la sensibilité • Instaurer un plan de mise en œuvre • Améliorer la coordination de l'UE • Protéger le citoyen en ligne
<i>10. Directives claires : afin de repenser la politique de l'UE en termes de processus</i>	<ul style="list-style-type: none"> • Les institutions européennes doivent développer une vision Claire du rôle des TIC • Mise en œuvre d'objectifs réalistes pour élargir les domaines politiques clés 	<ul style="list-style-type: none"> • Améliorer les niveaux de collaboration • Revoir les structures institutionnelles • Renforcer les liens vers d'autres domaines comme par exemple l'environnement

Sammanfattning

Den Europeiska unionen genomgår en djup- och vittomfattande förändring från ett industriellt till ett kunskapsbaserat samhälle

Rapporten syftar till att stödja en debatt om den bästa IT-politiken inför framtiden

Den Europeiska unionen (EU) genomgår en djup och vittomfattande omvandling från ett industriellt till ett kunskapsbaserat samhälle.

Informations- och kommunikationsteknik (IKT) genomsyrar praktiskt taget alla delar av våra liv. IKT är nära sammanvävt med vår önskan om en utvecklande och konkurrenskraftig ekonomi, uthållig miljö, och ett mer öppet, demokratiskt och sunt samhälle. IKT är en nyckel in i framtiden, som ger EU medborgaren inflytande, skapar tillväxt för företag och som hjälper oss att bygga ett öppet, innovativt, säkert och uthålligt kunskapsbaserat samhälle. Visionen om ett kunskapsbaserat samhälle utgår här från en respekt för mänskliga rättigheter. Det är ett delaktigt och öppet samhälle, som grundas på en konkurrenskraftig och grön ekonomi av uthållig tillväxt.

Näringsdepartementet upphandlade denna studie för att stödja en pågående debatt om den framtida IT-politiken inom EU. (Fortsättningsvis används den i Sverige vedertagna termen IT-politik, innesluttande alla tekniker inom IKT.) Studien var utformad för att identifiera de viktigaste politiska frågorna för EU inom IKT fram till 2015. Rapporten syftar till att:

- Utgöra ett viktigt underlag för en konstruktiv diskussion av IT-politik i Europa, inför en konferens i november som arrangeras under det svenska ordförandeskapet. Rapporten ska analysera nuläget, trender och utvecklingstendenser och ge en konsekvensbedömning för medborgare, företag och offentlig verksamhet inom EU, samt identifiera nyckelfrågorna.
- Uppdatera och identifiera ny politiska frågeställningar för EU inför 2015, mot bakgrund av i2010, det nu gällande IT-politiska initiativet i EU, som går ut 2010.
- Ange viktiga stöd- och förändringsåtgärder för att uppnå ett hållbart kunskapssamhälle.

En vision om det gröna kunskapssamhället

I korthet handlar rapporten om hur vi kan vidareutveckla ett europeiskt kunskapssamhälle i praktiken. Rapporten börjar med en vision om de sociala och ekonomiska fördelar för EU som följer av en balanserad och långsiktig IT-politik, som startar nu och fortsätter bortom 2015. De stora fördelarna med digital teknik kommer när tekniken är så gott som vardaglig, integrerad med vårt dagliga liv. Tekniken kommer att forma nya sociala mönster och förändra ekonomin i den Europeiska unionen.

Men hur kan vi förvalta och planera allt detta? Europa behöver en klar, balanserad IT politik som utgår från en djup förståelse av de politiska frågorna och den kontext där frågorna behandlas. Vi behöver en pragmatisk strategi för uthållig tillväxt och välbefinnande så att Europa kan hantera framtida utmaningar, såsom:

- Att omvandla Europa till det kunskapssamhälle som behövs i en globaliserad omvärld, med full sysselsättning.
- Att hantera effekterna av en åldrande befolkning samtidigt som offentliga tjänster uppnår bättre kvalitet.
- Ett omdömesgillt ansvarstagande för offentliga utgifter och miljömässiga konsekvenser.

Rapporten handlar egentligen om hur vi kan utveckla ett kunskapssamhälle i Europa i praktiken

Tre nyckelkomponenter avgör IT-politiken: sociala konsekvenser, behov av välfärd i termer av sysselsättning, tillväxt och offentliga utgifter, samt en ansvarsfull hantering av klimatförändringar

Tio politiska områden ska ge Europa en tydlig, balanserad IT-politik, med en bred syn på alla frågor, för att leda utvecklingen i det tjugoförsta århundradet

Centrala byggstenar

Denna studie bygger på tre centrala byggstenar.

För det första, IKT medför en djupgående förändring i våra ekonomiska och sociala liv. Till exempel, relationer mellan producenter och konsument i offentliga och kommersiella områden blir mer interaktiva och mångdimensionella, så långt att konsumenten upphör att vara passiv mottagare utan istället blir aktiv deltagare. Det får stora konsekvenser för det sätt vi interagerar, vår sociala organisation, förmedlingen av offentliga tjänster och hur offentlig förvaltning interagerar med medborgare. Detta betyder att vi måste vara allt mer medvetna om de mänskliga och sociala aspekterna av IKT. Dessa nyckelfrågor betonades nyligen av Europeiska kommissionens ordförande Barroso: 'att Europa åtar sig den radikala omvandlingen mot ett kunskapssamhälle'.

För det andra, vi har nått till ett skifte i omvandlingen mot en kunskapsbaserad ekonomi. De förändringar vi ser nu kan inte längre ses som en evolution från det industriella förgångna. Förändringarna är snarare revolutionära. Företagen som driver fram den kunskapsbaserade ekonomin behöver vara mer konkurrenskraftiga, kreativa och innovativa än någonsin. Det är centralt att Europa blir en ledande kunskapsbaserad ekonomi om vi ska kunna möta de sociala och ekonomiska förhoppningar som medborgarna bär på. Vidare, den aktuella ekonomiska nedgången öppnar ett omedelbart mål för IT-politik: att vara en viktig del av den ekonomiska återhämtningen och stärka den europeiska ekonomin. IT- och mediakommissionär Reding har understrukt denna potential i hennes senaste tal och framträdanden.

För det tredje, klimatförändringen är den viktigaste utmaningen i vår tid. IKT har en ledande roll i kampen mot klimatförändringar, genom dess förmåga att bidra till minskade koldioxidutsläpp. Ett globalt ledarskap inom detta område kan bli en ny och viktig möjlighet för Europas ekonomi – en 'Green New Deal'.

En praktisk plan för det gröna kunskapssamhället

Dessa tre byggstenar utvecklades från studiens forskningsinriktade sökande som innefattade många intervjuer med experter och nyckelaktörer. De tre byggstenarna utgör en grund för de tio politiska huvudområden som växte fram från intervjuanalyserna samt en kreativ workshop med ledande tänkare. Huvudområdena skapar en överordnad IT-politisk ram för EU, fem till tio år framåt:

1. Den kunskapsbaserade ekonomin: leder framtida välfärd
2. Kunskapssamhället: alla kan delta
3. Grön IKT: stöd till en eko-effektiv ekonomi
4. Nästa generations nätverk: balansera investeringar och konkurrens
5. Mjuk infrastruktur: investera i socialt kapital
6. SMF och IKT: stödja Europas små företag
7. En inre informationsmarknad: möjliggöra sammanhållning och tillväxt
8. Revolutionera e-förvaltning: ompröva offentliga tjänster
9. Förtroende on-line: en säker och trygg digital värld
10. Tydligt ledarskap: ompröva den politiska processen i EU

Dessa politiska områden analyseras mer detaljerat i rapporten. Varje område behandlar de huvudsakliga frågorna och de breda politiska målen fram till 2015, samt handlingsplaner för att uppnå målen. Ett urval av de viktigare målen och stegen för att nå dit visas nedan:

Politiskt område	Politiska mål till 2015	Politiska handlingsplaner
<i>1. Den kunskapsbaserade ekonomin: leder framtida välfärd</i>	<ul style="list-style-type: none"> Förbättrad IKT utbildning Ny regim för immaterialrätter i en digital era Användares delaktighet i innovation 	<ul style="list-style-type: none"> Främja nya affärsmodeller Bygg konsensus om nya immaterialrätter Utvidga användares delaktighet och kreativitet
<i>2. Kunskapssamhället: alla kan delta</i>	<ul style="list-style-type: none"> Sammanhållning och tillgänglighet för alla Förbättra den digitala kompetensen Förbättra stödet till de äldre 	<ul style="list-style-type: none"> Incitament för att utvidga nätverk och användning Stärk mänskliga rättigheter i en digital värld
<i>3. Grön IKT: stöd till en eko-effektiv ekonomi</i>	<ul style="list-style-type: none"> Skapa gröna IKT produkter och tjänster Förstå och utnyttja substitutions-mekanismer Utnyttja IKT i andra sektorer 	<ul style="list-style-type: none"> Undersök finansiella incitament Utvidga offentlig upphandling Forskning om hushåll och företags beteende F&U-stöd till nya styrsystem
<i>4. Nästa generations nätverk: balansera investeringar och konkurrens</i>	<ul style="list-style-type: none"> Behåll konkurrens i alla sektorer Främja öppen mjukvara och öppna standards Transparent internetförvaltning Främja (fasta och trådlösa) bredbandiga höghastighetsnät 	<ul style="list-style-type: none"> Tillämpa konkurrenslagstiftning kraftfullt i ökat tempo Uppmuntra öppna IKT, nätverk och standards Deltagande internetförvaltning Harmoniera EUs frekvenspolitik Balansera investeringsvilja och tillträde till nätverk
<i>5. Mjuk infrastruktur: investera i socialt kapital</i>	<ul style="list-style-type: none"> Lansera uppbyggnads- och utrullnings program för tjänster (e-hälsa, e-utbildning, etc.) Säkerställ att investeringar stimulerar ekonomin i EU Använd grön IKT 	<ul style="list-style-type: none"> Identifiera nyckeltjänster och skapa en vision för mjuk infrastruktur i Europa Utveckla affärsidéer Finansiera design, piloter och utrullning
<i>6. SMF och IKT: stödja Europas små företag</i>	<ul style="list-style-type: none"> Utvidga och fördjupa användning genom bredband och molntjänster Stöd mindre företag med potential för innovation och tillväxt Mer stöd till SMF i glesbygd 	<ul style="list-style-type: none"> Identifiera nyckeltjänster och skapa en vision för mjuk infrastruktur i Europa Utveckla affärsidéer Finansiera design, piloter och utrullning
<i>7. En inre informations-marknad: möjliggöra sammanhållning och tillväxt</i>	<ul style="list-style-type: none"> Påvisa ekonomisk nytta Utnyttja kunskapsbaserad ekonomi och grön IKT Förenkla reglering 	<ul style="list-style-type: none"> Främja framgångsfaktorer Uppmuntra en inre marknad av offentliga tjänster Förbered avreglering som passar för olika segment
<i>8. Revolutionera e-förvaltning: ompröva offentliga tjänster</i>	<ul style="list-style-type: none"> Medborgare som deltagare snarare än skattebetalare Öka medverkan över medlemsstater 	<ul style="list-style-type: none"> Sprid bästa exempel i delaktig e-förvaltning Jämför medborgares delaktighet i medlemsstater Etablera öppna plattformar för att utveckla tjänster
<i>9. Förtroende on-line: en säker och trygg digital värld</i>	<ul style="list-style-type: none"> Övervinn organisatoriskt motstånd Förbättra skydd av kritisk IKT infrastruktur Skydda individers rättigheter Säkerhet och tillförlitlighet för alla 	<ul style="list-style-type: none"> Öka medvetenheten Planera för implementering Förbättra samarbete inom EU Skydda medborgaren on-line
<i>10. Tydligt ledarskap: ompröva den politiska processen i EU</i>	<ul style="list-style-type: none"> Europeiska institutioner utvecklar helhetsvision om roll för IKT Realistiska delmål för politiska nyckelområden 	<ul style="list-style-type: none"> Förbättra samarbeten Granska institutionella strukturer Stärk länkar till andra politiska områden, som miljö

A Vision of a Green Knowledge Society

Europe is on the brink of the knowledge society.¹ The rapid take up of information and communication technologies (ICT) over the past two decades has transformed our economy. ICT is now fundamental to the running of EU economies across every sector, from manufacturing and energy to transport, retailing and health services. The social impacts of ICT are even more profound as relationships within families and organisations are being reshaped.

What is quite unique is that such a complex technology has become so vital and ubiquitous so quickly. While our dependence has become absolute, there is some way to go before all European citizens participate fully in the knowledge society. This is just one of several big challenges that demand urgent attention from policy makers.

Of course, Europe has been anticipating the knowledge society for several decades. Until now the EU has been in a preparatory phase with initial visioning and support for innovation with ICT through a range of creative programmes at EU and Member State level. Now is the time for Europe to focus on a well thought out, useful ICT policy up to 2015 and beyond. As one interviewee in our research remarked:

The Lisbon agenda is a work in progress but in future we need to link the many good initiatives much better to wider action.

At this time, Europe must also strive to recover from

¹ The term 'knowledge society' is preferred to 'information economy' since increasingly people and enterprises are moving beyond fairly passive access to information to exploiting it in new creative patterns that reflect their comfort in use of ICT, be it for personal social networking or impacts of networked weather reports on transport logistics.

the current economic crisis, while its competitiveness problems have not gone away. Thus it is imperative that Europe seizes any opportunities offered by the transition to the knowledge society.

Thus, the purpose of this report is to identify the critical issues for ICT policy up to 2015 and produce a well-reasoned and practical framework for ICT policy for the EU covering the critical issues. Following the introduction, each section covers a key area that must be addressed to move forward. This report's overall aim is to provoke debate, as a brief focus for discussion of what ICT policy should be up to 2015, with a trajectory going well beyond.

The study gathered data and opinion from many experts and stakeholders from around the world, and this forms the basis of this report. As well as consultations across the EU, including the European Commission and European Parliament and Member States, we spoke with experts in the USA, China, Japan and South Korea. Our research method and sources are shown in appendix.

ICT policy to support the knowledge society

Previous motivations behind ICT policy such as those of the landmark Bangemann report (European Commission, 1994), have been fundamentally transformed by our progress towards an ICT based society and economy. The Bangemann report accelerated the liberalisation of the EU telecommunications market, largely from an industry viewpoint. More recently EU policy has evolved into a programme of strong support for ICT innovation. Now there is a need to reassess ICT policy from a social standpoint and also with a basic economic foundation.

We need to move towards a coherent and overarching

ICT policy as the way governments support a 'knowledge society'. Such a policy should embrace the rigour of consumer protection, market regulation, risk analysis, and so on, with its own body of administrative law, such as that concerning privacy, online profiling and retention of data. This is a much broader concept for ICT policy than traditionally conceived. Because ICT now underpins everything in our economy and society, it needs to be thought of in much the same way as energy, taxation or sewage. That demands a realistic and constructive policy for everyday use and to support long-term goals, and this is the aim of this report.

However there is a stubborn dilemma here. ICT policy must exist in a world of vertical sector policies, although each ICT policy issue is likely to be reflected in the technologies embedded inside each of the sectors, and all are likely to see their own ICT issues as unique. Thus one should ask: can we implement a forward looking policy when ICT is essentially horizontal and so will conflict with sector policy, although it may have cross-sector impacts? Solutions to address these concerns are considered in this report. Also, at the foundation of such an ICT policy for Europe lays the question – what kind of knowledge society do we want?

The situation is further complicated by the EU's global context. In any search for jobs, there is also a worldwide competitiveness agenda. Market opportunities in ICT goods and services are emerging which Europe cannot ignore. As one interviewee in our research posed the question: if the future is an ICT future, made in Asia, designed in the USA and consumed everywhere, what then is the role of Europe? Or as another interviewee noted:

There is a need for an EU competitive strategy in ICTs. We need much stronger measures to compete in world markets – for instance, we could use the large EU structural funds for ICT which dwarves those from central funds.

So the market issues are also policy challenges for Europe. Can the EU truly compete in this world or will it just cede the ICT market to others?

These are important questions since the EU continues to lead in some major ICT areas – for instance in the key domain of mobile communications; in others – operating systems, microprocessor hardware and the future of the internet itself – Europe has ceded leadership. Examples such as Skype, Linux and the ARM microprocessor designs for mobile handsets were all European in their start-up phase, and some are still leaders based in Europe today. Despite being technically advanced in grid or cloud

computing, in commercial terms the EU now appears to be lagging. Web technology originally came from work at CERN but 'Web 2.0' services are driven commercially from the USA. The direct economic contribution from ICT was estimated to be worth €670 billion (5.6 percent) in 2007, but it could be so much more. Importantly, use of ICT is estimated to account for half of the EU's productivity growth between 2001 and 2004.²

Clearly the forces driving the knowledge society are both complex and act long term. That does not mean that Europe is powerless or has to be a passive 'victim' of the knowledge society. Europe has both the responsibility and capability to shape the knowledge society so that it best serves the interests of its citizens.

That responsibility begins by setting a vision of the future. This can determine the high level objectives for the EU and, in turn, sets the agenda and priorities for actionable policy issues and initiatives. Of course, the many stakeholders might be expected to differ widely in views and priorities for ICT policy. However, perhaps surprisingly, our survey of experts' opinions found widespread consensus about what the future vision should be.³ Essentially the vision is of a *Green Knowledge Society* – a Europe in which citizens and enterprises are empowered through ICT in an inclusive, innovative, secure and sustainable knowledge society.

Thus, there are three key aspects to the Green Knowledge Society.

- **Economic – a knowledge economy is the way forward for a competitive European economy to generate sustainable growth and employment through innovation and to enable social and environmental goals to be pursued. Investment in ICT in support of Green Knowledge Society goals would additionally provide a much-needed short-term economic boost.**
- **Societal – a knowledge society is an inclusive society in which everyone should be able to participate, including those less able, so that this entry becomes part of basic human rights. It is the power of individuals acting in concert that drives innovation.**
- **Environmental – the Green Knowledge Society is a sustainable society so that growing use of ICT must support an eco-efficient economy. It has overtones in**

² See http://ec.europa.eu/enterprise/index_en.htm/

³ Over 50 expert interviews from all stakeholder groups were conducted as part of this study, see study methodology described in the Appendix.

the economy, specifically with use of sustainability to drive new products, processes and industry sectors, highlighted by several interviewees as a 'Green New Deal' for Europe.

The Green Knowledge Society is therefore built on fundamental principles of a civilized society for the 21st century. It needs wealth creation, justice, equality, responsibility to future generations, and stewardship of natural resources to enable citizens to participate in society and fulfil their potential. The concepts of a knowledge society and environmental sustainability are seen as inextricably linked. This is not simply *zeitgeist* but a genuine coming together of agendas that mutually support each other. But how is Europe going to achieve such a vision?

Perhaps unsurprisingly the policy presented revolves

around the themes of the economy, human rights and sustainable development, with the global competitive context in mind. These three guiding objectives for the Green Knowledge Society set short, medium and long-term directions in each area:

- Provide a short-term boost in response to the current economic crisis, laying the platform for a long term more competitive economy, based on knowledge assets
- Build an inclusive society for all, and
- Give impetus to the urgent pursuit of a sustainable, eco-efficient economy.

The study now focuses on the practical policies to achieve these goals. Our survey of experts and other research

Figure 1. The Green Knowledge Society: its three main goals and supporting policy areas



identified a complex and interactive web of policy areas necessary to support the implementation of the Green Knowledge Society. This web of policy areas is shown in Figure 1.

The illustration depicts the Green Knowledge Society as the end goal, with an inclusive knowledge society as its foundation. Pursuit of a knowledge economy provides the impetus through a short-term economic boost. Achieving the objectives requires clear leadership and a rethinking of the policy making processes. The other key drivers of what we might see as a 'Green New Deal' for Europe are identified and make up the following list of ten key policy areas:

1. **The knowledge economy: driver of future wealth**
2. **The knowledge society: participation for all**
3. **Green ICT: support for an eco-efficient economy**
4. **Next generation infrastructure: balancing investment with competition**
5. **Soft infrastructure: investing in social capital**
6. **SMEs and ICT: supporting Europe's small enterprises**
7. **A single information market: enabling cohesion and growth**
8. **Revolutionising eGovernment: rethinking delivery of public services**
9. **Online trust: a safe and secure digital world**
10. **Clear leadership: rethinking the EU's policy making process**

These ten policy areas emerged for the following reasons. Our interviews, especially with leading thinkers, indicated that the knowledge society and the green ICT agenda were inextricably linked in setting the direction for a future Europe. This is not just for economic reasons but for the purpose of developing a different kind of society, oriented to sustainability, individual creativity and the SME as the European economic unit of growing importance.

From the overseas interviews and research source documents it became clear that an even stronger line was being prepared for this in ICT policy in Korea and Japan, with a reversal of former ICT-based command and control five-year plans. Instead, the sources revealed a more generic approach in which

ICT supports all sectors. A second strand was the undercurrent of concern about the recession and how to move away from that, by using ICT support for the economy.

An interesting point referred to many times was the advance in specific sectors, such as education and health, with other areas that could form the European 'soft infrastructure' and also an emphasis on eGovernment. At the same time we heard much on the future hard infrastructure, which was construed as being far more than just radio signals and cabling in ducts, especially by the more advanced web industry players. A new era infrastructure is the basis for most people for doing things in cyberspace at a higher level – ie it is really the services, websites, mobile world, software, and content that make up the digital era. The single market came up many times as the factor that influenced all others, especially from the supply side commentators. Safety and security for all, specifically critical infrastructure protection, figured in many discussions and policy studies. Moreover there was a strong call for new leadership from the EU across the whole of ICT policy from almost all communities of interest. All of these advances are touched by the principle of supporting a 'Green New Deal'.

In the following sections we look closely at each of the policy areas, first explaining the situation and its complications and then elucidating the key question(s) for ICT policy. Potential solutions at a policy level follow and we try to show whether we are exposing new issues, or giving a new take on an existing issue or examining issues that are important and well treated but still require attention as part of the policy for the future. Naturally there may be omissions for brevity as our aim is to dwell only on top-level issues.

1. The Knowledge Economy: Driver of Future Wealth

KEY ISSUES

- Knowledge work is growing and is the source for future jobs growth
- Europe is at a 'tipping point' – the shift to the knowledge economy is revolutionary
- ICT infrastructure underpins the knowledge economy and depends on knowledge workers with necessary skills
- Investment in ICT supports long term goals and provides a much needed economic boost as part of economic recovery

The knowledge economy is revolutionary

The economy is changing. It is in transition from an industrial economy to a knowledge economy. Or rather, there is a shift in the make up of the economy away from manufacturing and towards services, and 'knowledge work' is making up a growing proportion of all work in the economy. Official statistics show the productivity gains in all sectors resulting from use of ICT, and evidence shows for instance, the relationship between productivity and broadband availability (see www.euklems.net). A growing proportion of jobs in the EU are 'knowledge jobs' (30-45% depending on the Member State), and this is growing while non-knowledge work is in decline (Rüdiger and McVerry, 2007; Brinkley, 2008). Manufacturing will continue to be important but as a proportion of the economy it is decreasing while knowledge-based activities are growing.

But if this transition is taking place over many decades, should we not let this process follow its natural course and let the economy adapt over time? The opinion of experts consulted in our survey suggests this would be complacent. Increasingly the view we encountered was that we have reached a tipping point, whereby the small changes that we see everywhere around us have accumulated to the point where massive qualitative change is upon us. In other words, the shift to the knowledge

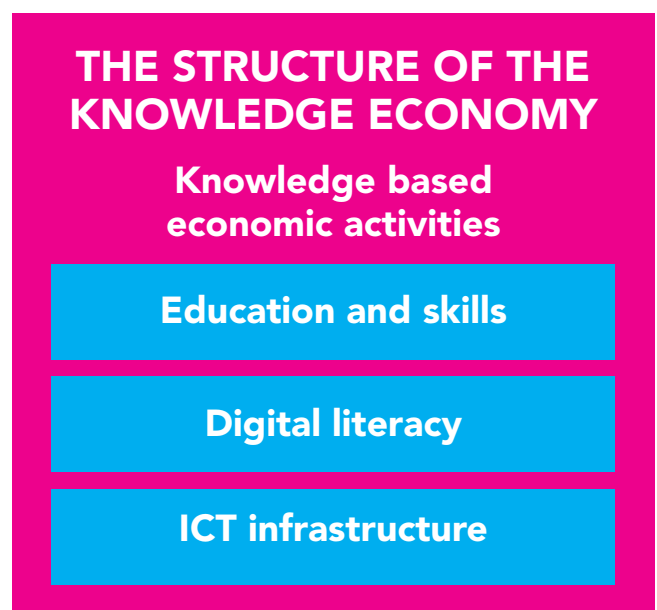
economy is no longer evolutionary – it is a revolution.

Thus we can no longer think about the knowledge economy simply as a long-term project for the future. A major investment in ICT in pursuit of the knowledge economy offers one of the few effective levers available to policy makers both to provide a real short-term boost to the economy to assist the recovery from the current crisis and to accelerate the long-term transformation. Investment in ICT has been shown to be an effective stimulus to economic growth. Research by Waverman, Meschi and Fuss (2005), for instance, has demonstrated the positive impact of the mobile industry on driving GDP and economic growth.

Thus ICT infrastructure underpins the knowledge economy (Figure 2) and calls for greater ICT literacy across the working population. It also needs other investments in education, training and reskilling to support the knowledge worker.

The current economic crisis is a wake-up call and presents us with an opportunity to embrace the

Figure 2. The structure of the knowledge economy



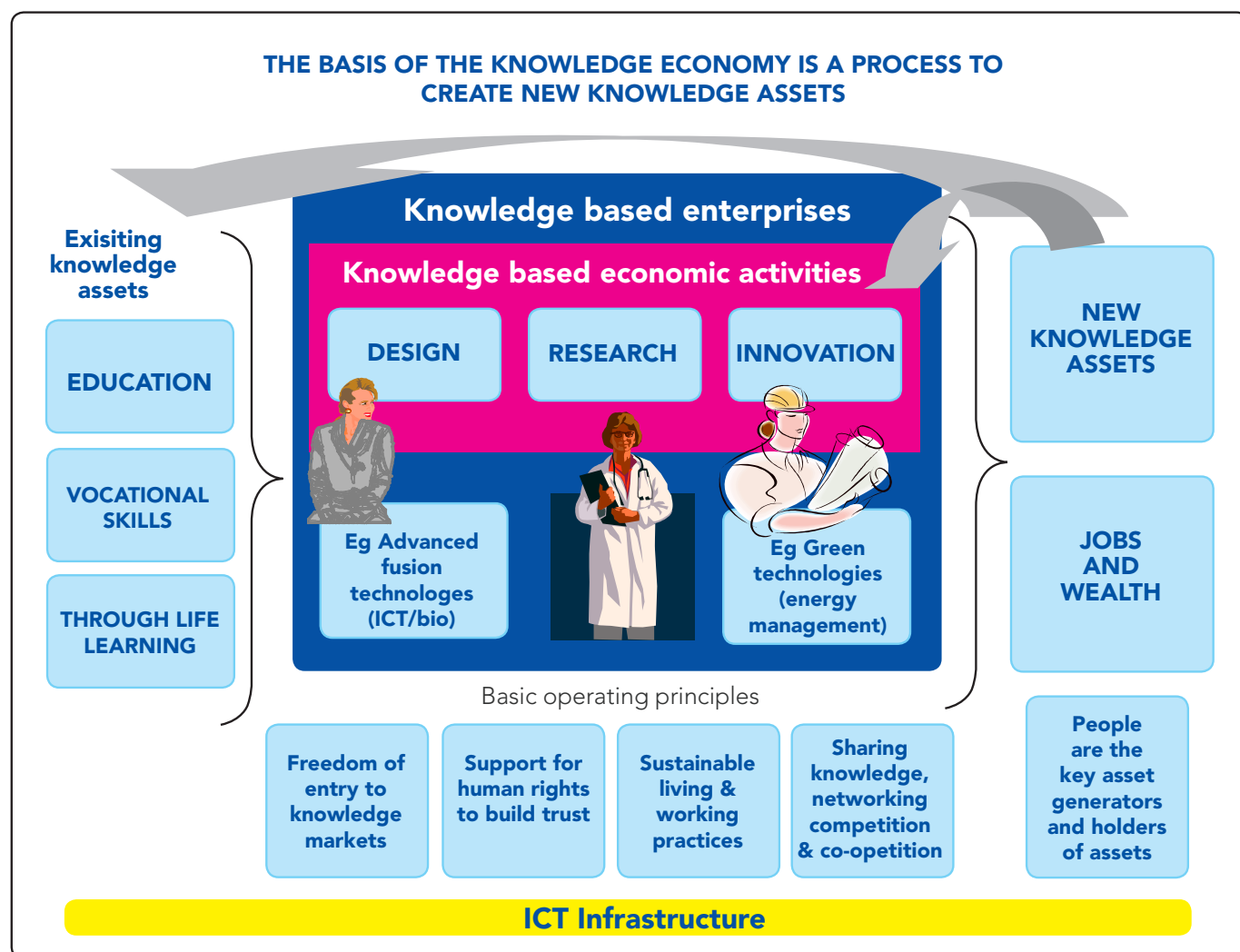
knowledge economy. Indeed the economic turbulence we are experiencing may well be a symptom associated with the radical transformation from one state to another. This is clearly recognised by EU President Barroso, who wrote to the Heads of State and Government on 17 June calling for 'a Europe committed to the radical transformation towards a knowledge-based society'. Commissioner Reding, too, clearly appreciates the potential for ICT to contribute to the economic recovery, as shown by her recent speech on 'Digital Europe – Europe's fast track to economic recovery' (Reding, 2009).

How can the EU accelerate the transformation to the knowledge economy?

A radical approach is needed if Europe is to capitalise on the opportunities afforded by ICT. For instance, using digital dividend spectrum arising from analogue

TV switch off for advanced mobile services rather than broadcasting could boost Europe's GDP by as much as 0.6% per year to 2020, generating thousands of jobs throughout the EU (Forge, Blackman and Bohlin, 2007). A 'business as usual' approach will not unleash the creative potential that is necessary to ensure a thriving economy in the future. Unless we are bold, creativity and innovation may well migrate to other regions of the world, taking jobs and economic development with them. Moreover, a successful knowledge economy is the foundation for social and political renewal and the knowledge society. If this analysis is correct, then the key question is how can the EU accelerate the transformation to the knowledge economy? There are many subsequent questions that follow from this including: how can we develop a more innovative culture within the EU? Where and how are new knowledge jobs going to be created?

Figure 3. Key elements of the knowledge economy and its value creation process



Policy to support innovation

Building the knowledge economy primarily entails enabling a creative, innovative and competitive economy. The key feature of the knowledge economy is the capacity of knowledge-based enterprises to create new knowledge assets (see Figure 3).

As enterprises increasingly understand the importance of investing in intangible assets – knowledge, management, communication, IPR, patents, etc – so too as a society we need to support this throughout the value chain. Policy to support the knowledge economy inevitably goes far beyond a narrow definition of ICT policy but as ICT permeates everything, ICT policy too has to reflect this, especially opportunities in a ‘Green New Deal’. A prerequisite for a knowledge economy is an educated and skilled workforce and so it is no surprise that even greater emphasis has to be placed on education, vocational training and lifelong learning in all Member States, from cradle to grave.

POLICY GOALS FOR 2015

- **Improved education and ICT training for skilled knowledge workers**
- **New IPR regime for the digital era**
- **Increase user involvement in R&D**

In this model of the knowledge economy, knowledge-based enterprises are the generators of new knowledge assets and in doing so also generate new jobs and wealth. Activities concerned with design, research and innovation assume a more dominant role. These activities are increasing in speed and intensity as the need for enterprises to innovate to survive and compete grows ever stronger. To some extent EU policy already supports these activities through the framework programmes for R&D, but what is needed for a knowledge economy is somewhat different. Much of this is well understood within the EU – see the Aho report, for instance, which presented a strategy for an innovative Europe and called for a much more innovation friendly market for businesses (Aho, 2006). We are experiencing a dramatic shift in the way of doing R&D away from the traditional, formal, closed ways towards new, more informal and transparent methods. Being close to the market now means that users are not only participating in the research process but also becoming the innovators themselves (NESTA, 2008; Leadbeater, 2008).

Several interviewees in our survey posed the question:

why it is that nearly all of the creativity and innovation in the internet/web space seems to be occurring outside the EU and predominately in the USA? Most of the recent significant internet developments – Google, eBay, Amazon, MySpace, YouTube, Facebook, Twitter – are not European in origin. Skype and Spotify show that Europe can be innovative but it seems that Europe has difficulty in fostering companies to become major global players. None of these innovations came from large enterprises. Large companies excel at the kind of innovation that sees iterative improvements in products, processes and services, but the radical innovation associated with creative destruction emerges from new, small and nimble enterprises (Schumpeter, 1975; Bower and Christensen, 1995). In fact European innovations and successful start-ups are often bought by companies such as Microsoft and Google. Of 53 Google acquisitions in 2001-08, 14 originated outside the USA, and half of those were European companies. For Microsoft, of 81 acquisitions during the same period, 25 were non-US companies, and 12 were European.

Some interviewees pointed to the need for Europe to move away from a ‘permission to innovate’ culture. For instance, one of the few examples of European innovation is the file sharing service Pirate Bay, which challenges current intellectual property rules. Rather than attempt to stymie this innovation, we need a more thoughtful response and to rethink rules around protection of intellectual property rights so that they are fit for a digital economy. Member State governments currently retain orthodox views about protection of intellectual property but we may need to embrace radical solutions if innovation and creativity is being held back (Boldrin and Levine, 2008). One such idea is Google’s suggestion to a right for entrepreneurs to challenge legislation that they feel hampers innovation (Lundblad and Hampton, 2009).

Moreover, as we see some traditional business models failing, eg advertising funded news media, we need to see innovation in new business models to find ways to monetise new digital services. Venture capital also has a key role to play here in helping innovative small firms make the transition from start up to production but the venture capital sector in the EU is poorly developed. It strongly suggests a shift in EU and Member State support in the following ways:

POLICY ACTIONS

- **Devote more resources for primary, secondary and tertiary education as well as vocational training and**

lifelong learning. Enterprises should be incentivised to train staff and generally to invest in intangibles.

- Kick-start the transition to a knowledge economy through the programmes outlined elsewhere in this report for green ICT (policy area 3), soft infrastructure (policy area 5),) and eGovernment (policy area 8).
 - Initiatives that promote competitiveness and innovation and user involvement in R&D such as Living Labs should be expanded, eg, with the ICT Policy Support Programme under the Competitiveness and Innovation framework Programme (CIP).
 - New ways of reaching out to innovative, small, early stage enterprises must be found, since current initiatives pass them by because they are commonly seen as placing far too much of an administrative burden.
 - New thinking is needed to find the right balance so that there is proper protection but also fewer barriers to creativity especially in patents and IPR for ICTs. The purpose of such a system should be to promote use and innovation and should not just be to protect the interests of the major players. In particular we must find ways to make sharing of content legal, for instance via a simple licensing or clearing system for digital rights. This will require leadership from the European Commission across several Directorate Generals, and bringing together Member States, content creators and consumers to achieve consensus.
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2. The Knowledge Society: Participation for All

KEY ISSUES

- All of the EU's citizens should have the opportunity to participate in an inclusive knowledge society
- Participation rates vary enormously within and across Member States
- ICT infrastructure underpins the knowledge economy and depends on knowledge workers with necessary skills
- Being an active member of society means participation in the knowledge society is becoming essential

Participation in the knowledge society is essential

We found widespread consensus in our interviews that Europe's goal should be a knowledge society rather than a mere knowledge economy. It means two things in particular: first, it reflects the fact that ICT not only enables the economy to be more productive but it also brings far reaching and profound social and cultural change; and second, it implies that the opportunities afforded by the knowledge society should be open to all of the EU's citizens so that Europe's future society is inclusive and cohesive.

Our focus here is on the importance of Europe's future society to be as inclusive as possible. In this regard

significant progress has been made over the past decade. Fifty six percent of European citizens now use the internet on a regular basis (Eurostat, 2009a), although there is wide variation across the EU. Citizens in the eastern and southern Member States may be less likely to be internet users than those in northern and central Europe. So while 83 percent of the Dutch use the internet, only 26 percent of Romanians do so.

While steady progress is being made, the tipping point argument also applies here. In other words, in order to be an active member of society in the EU today, it is now essential not only to have access to advanced electronic networks, but also to have the capability to use these networks for online services, eCommerce, communication, social networking, and so on. Indeed, several of our expert interviewees remarked that we are reaching the point whereby participation in the knowledge society is becoming obligatory because some organisations are promoting online access to services at the expense of 'real world' access. Of course we want to see provision and use of online services grow but there is a real prospect of a knowledge society evolving that excludes a sizeable proportion of the EU's population. That would be disastrous for the EU socially and economically and it must be addressed as a matter of urgency

Can't play, won't play

If access to networks and the capacity to use services are

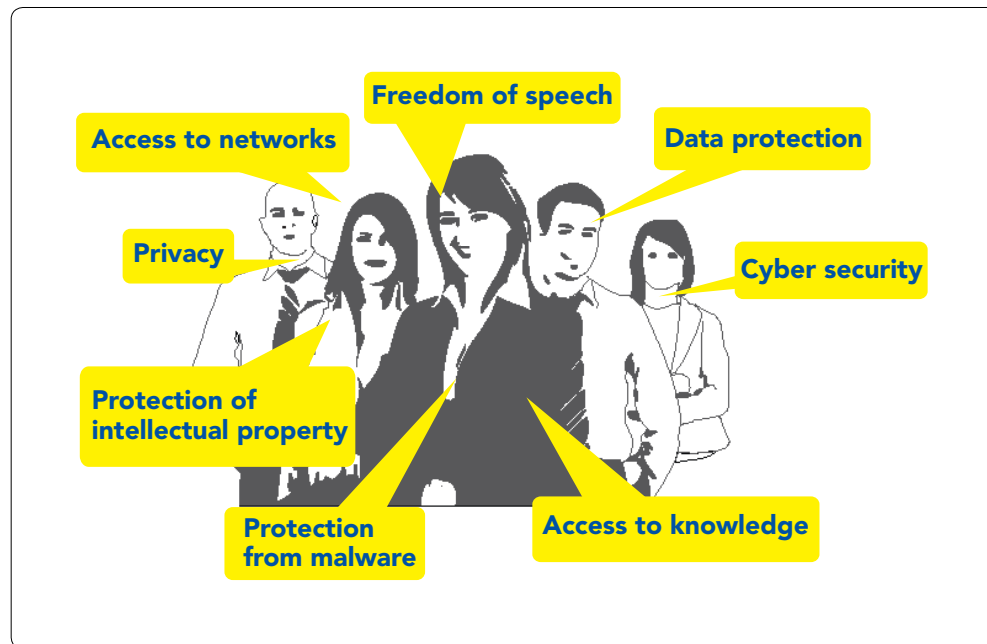


Figure 4. Digital rights in the knowledge society

necessary to participate in the knowledge society, then a key question is whether these should become fundamental rights that should be enshrined specifically in a kind of charter of digital rights. As well as the right to access, such rights might include freedom of speech, privacy, identity, data protection, security, and protection from malicious software, IPR, and so on (Figure 4). More specifically the EU and Member States urgently need to renew efforts to engage with those currently excluded from the knowledge society. To do so, we need to better understand the make up of those who are not participating, and the reasons why. Are the barriers to do with the availability and access to networks, or are they more to do with the capability and willingness of individuals to participate?

As far as access to networks is concerned, progress is again being made but overall broadband penetration rates, which currently average 23 percent in the EU, disguise the fact that coverage of high speed networks and take up across Europe is patchy. Urban areas in the EU are now well covered by broadband, with an average of 93 percent of the population covered. Coverage of rural areas is improving but still only covers 77 percent of the EU-27 rural population. The biggest problems lie in Bulgaria

(with coverage of 20 percent), Romania (34 percent), Poland (43 percent), Slovakia (43 percent), Greece (55 percent) and Latvia (68 percent) (European Commission, 2009a). Rural areas are also disadvantaged in terms of download speeds.

Access is a prerequisite but capacity and motivation are the bigger barriers. Research shows that certain demographic groups are less likely to access the internet for a variety of reasons. For instance, we know that women and those who are old, retired, unemployed, disabled, have low income, or poor educational attainment are less likely to use the internet. Recent research in the UK (FreshMinds, 2009) showed that of internet non-users, 63 percent were retired, 66 percent had low educational qualifications, 58 percent were casual workers or on welfare benefits, and 55 percent were women. Moreover, there is increasing evidence of secondary digital divides – it is not just who is using the internet but what they are using it for.

Figure 5 shows that the main reasons why people don't use the internet are because they say they don't need it, can't afford it or lack the skills. The Community Survey on ICT usage in households and by individuals (2008) shows that

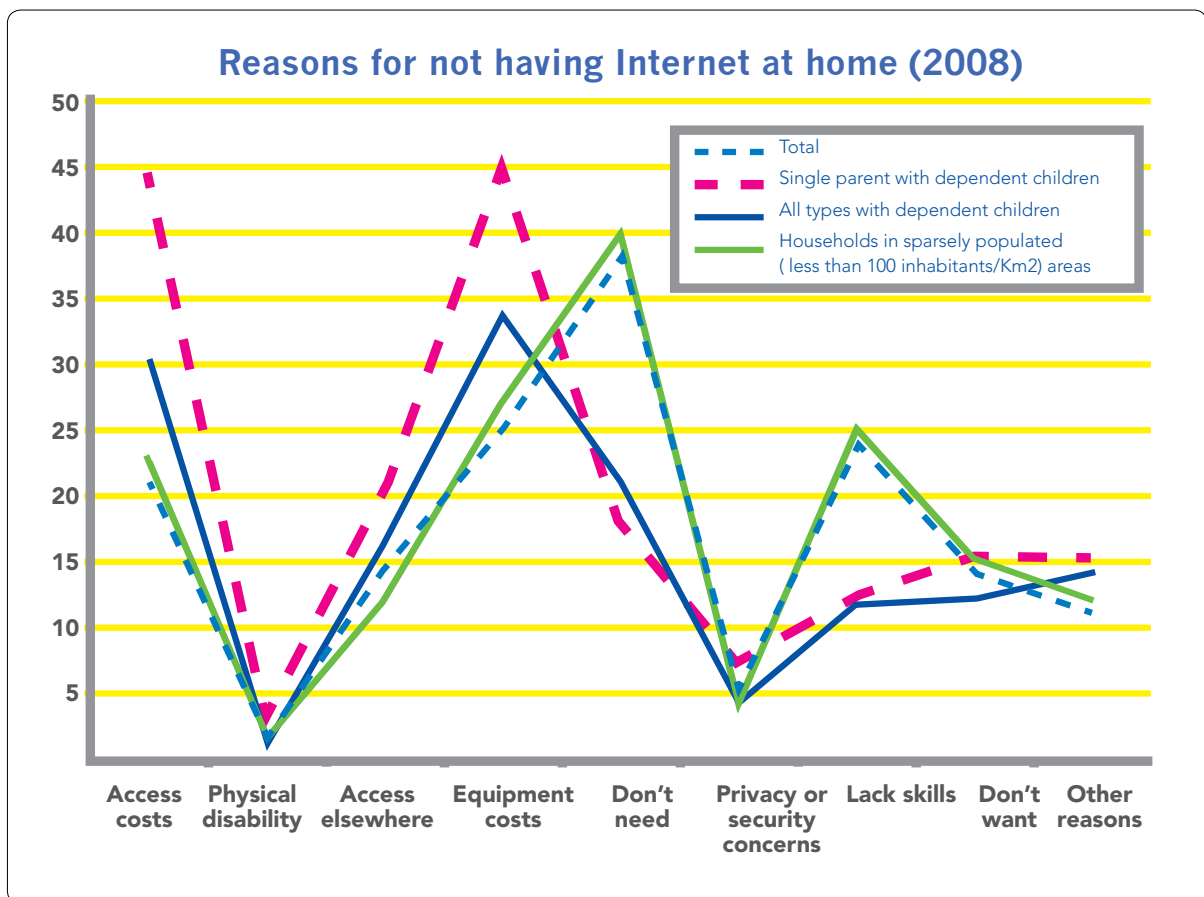
the main reason for not having internet in the home is the perceived lack of need (38 percent). Costs for equipment (25 percent) and access (21 percent) remain a barrier, as well as a lack of skills (24 percent). Privacy and security concerns (5 percent) and physical disability (2 percent) are less frequently barriers although significant for some.

This highlights a potential big problem in the quest for an inclusive knowledge society. Even if we can address the issue of access and affordability, and also solve the skills and confidence question through training, there will still be some – perhaps as much as 10 percent of the population – who do not want to be part of the knowledge society. Addressing those who *won't play* as well as those who *can't play* will be just as necessary for an inclusive knowledge society. The right to opt out should be protected but the implications of this are as yet unclear.

Policy support for eInclusion

Policy support for eInclusion has to be seen within an overall context of human rights. Some see the need to create a special contract for citizens with regard to the knowledge society – a charter of digital rights. Spain for instance has established a Charter of Rights of Telecommunications' Users as part of its Avanza2 Plan. Our consultations on balance argued against this. Instead there should be no distinction between rights in the digital world and the real world. In creating a charter of digital rights there is a danger of creating a 'digital ghetto'. Preferably digital rights should be considered within the overall framework of human rights. Initiatives such the eYouGuide online tool are welcomed. This gives practical advice on the digital rights consumers have under EU law, addressing consumer issues like the rights towards

Figure 5. Reasons for not having internet at home



Source: European Commission, 2009a

broadband providers, shopping on the web, downloading music, and protecting personal data online and on social networking sites.⁴

POLICY GOALS TO 2015

- **Inclusion with universal access**
- **Raise educational standards**
- **Improve digital literacy**
- **More support for particular groups, especially older people**

This does not negate the need to address issues of access to electronic networks and the capability to use them. That requires policy on two main fronts – policy to increase broadband coverage across Europe, and also to increase take up. eInclusion, of course, has long been recognised by the EU as an important policy goal, with the 2006 Riga Declaration setting some ambitious targets, most notably to increase broadband coverage in Europe to at least 90 percent by 2010 and to halve the gap in internet usage by 2010 for groups at risk of exclusion, such as older people, the disabled and unemployed. The importance of improving coverage was highlighted again recently with Commissioner Reding calling for broadband coverage of the whole EU by 2010 and high speed broadband by 2013 (Reding, 2009). This is ambitious but the initiative should be supported.

Otherwise two main policy thrusts are apparent. First is the clear message that raising the overall level of educational attainment is key, not only for a knowledge economy, but also for an inclusive knowledge society. Second is the more immediately addressable need to rapidly improve digital literacy across the EU, with targeted and innovative programmes aimed at the segments identified above. The difficulties of older people require particular attention. It is often assumed that the age related problems associated with internet use are temporary – that future older generations will be digital natives and familiar with ICT and therefore the problem will disappear. There may be some truth in this but there is need for caution for technology will continue to develop and we cannot assume that using it will become easier for older people since, unfortunately, cognitive ability as well as the willingness and capability to adapt will always diminish with age.

The recent Digital Literacy Review found Member States have been making progress in providing access and promoting basic internet use. However, to build the knowledge society it is imperative that we address those EU citizens who are currently excluded, particularly to

adjust to new needs and emerging digital divides in the quality of use. There are now good examples of effective digital literacy programmes that motivate non-users, and improve their skills. Large-scale examples include South Korea's recovery efforts following its financial crisis in 1998, to train a large portion of the population in digital literacy. Best practice, for example through initiatives such as the UK's network of Online Centres,⁵ should be promoted throughout the EU.

POLICY ACTIONS

- **Incentives to extend networks and take-up**
- **Digital rights within human rights**
- **Spread best practice in eInclusion and digital literacy throughout the EU**

4 <http://ec.europa.eu/eyouguid>

5 The UK Online Centres and myguide were awarded with a Good Practice label in the framework of the European eGovernment Awards 2009, <http://www.epractice.eu/en/awardsfinalists2009>.

3. Green ICT: Support for an Eco-efficient Economy

KEY ISSUES

- Understanding the problems - and solutions - in order to move from awareness to action
- Saving energy by judiciously applying ICT
- Waste and energy consumption in ICT use
- Harnessing green ICT for Europe's economy

What are the problems – and how big are they?

Under the banner of 'green ICT' are a range of diverse subjects which have major economic impacts on Europe.

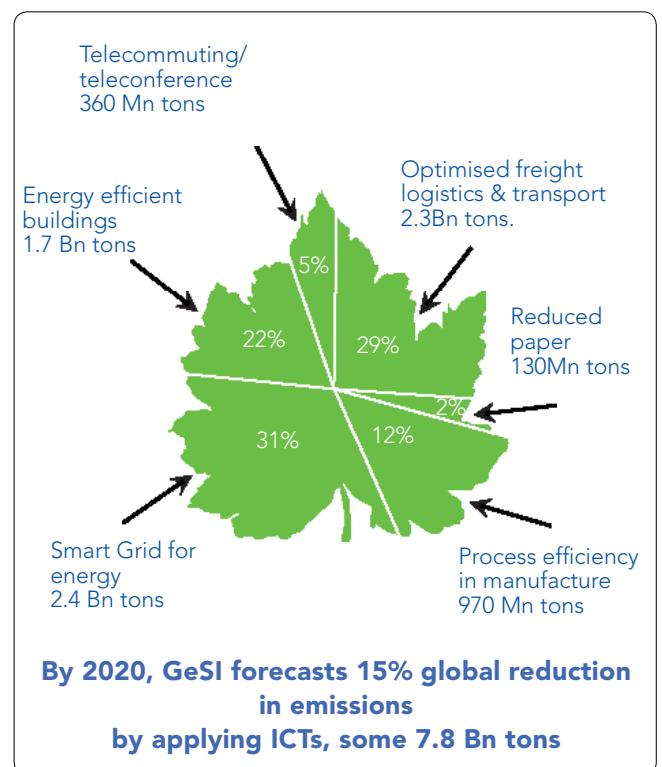
First, ICT can be applied to save energy and materials consumption in industrial processes, energy distribution, vehicle emissions, building controls, and so on

(see Figure 6).

Thus the largest influence of ICT is likely to be in enabling energy efficiencies in *other* sectors. These could deliver CO₂ emissions savings five times greater than the total emissions from the entire ICT sector in 2020 (Climate Group, 2008). Up to 30 percent of energy savings worldwide are possible through better monitoring and management of electricity grids (Climate Group, 2008). Mobile communications alone could save 2.4 percent of total EU emissions by 2020 through efficiencies in industry and energy distribution practices (Vodafone, 2009). The EU's manufacturing sector accounts for 30 percent of its energy consumption. Applying ICTs across the value chain could make massive savings, eg intelligent motor drives could reduce electric motor consumption by 20-40 percent (European Commission, 2009b).

Estimates in Figure 6 for total savings from the application of ICT imply 15 percent fewer emissions in

Figure 6. Impacts of applying ICT on greenhouse gas emissions



Source: The Climate Group, 2008

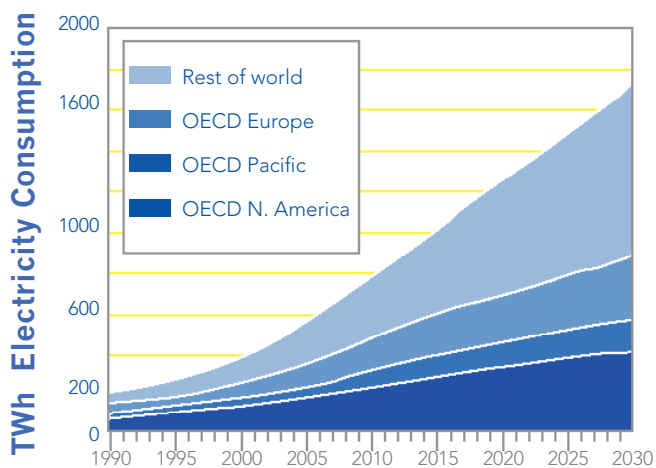
2020, which translates to some €600 billion of energy cost savings. Thus ICTs may represent a significant proportion of the reductions below 1990 levels that scientists and economists recommend by 2020 (Climate Group, 2008).⁶

⁶ The Stern Review suggested that developed countries reducing emissions by 20-40% below the 1990 levels would be a necessary interim target based on IPCC and Hadley Centre analysis (Stern, 2008). Figures expected for savings are (Climate Group, 2008): €553 billion in energy and fuel saved and an additional €91 billion in carbon saved, assuming a cost of carbon of €20/tonne, for a total of €644 billion savings

Second, on the consumption side, ICT takes a growing proportion of the global energy budget and greenhouse gas emissions in themselves, be they for consumer goods, or web searches or ICT use in business. CO₂ emissions from data centres are increasing with larger internet webserver farms. Consumer ICT devices present the largest ICT energy load, especially mobile handsets, personal computers and TV sets (IEA, 2009). There are some four billion mobile handsets globally, with about 500 million in Europe; they require recharging as well as energy consumption for manufacture and recycling on a vast scale. Never before have so many had such a critical need for electrical power for a personal device. ICT products and services consume some 7.8 percent of EU electricity and may grow to 10.5 percent by 2020 (European Commission, 2009c). Short product life leading to rapid replacement is a further burden. The extreme is mobile phones, which may have a life of less than 12 months in some cases. ‘Planned obsolescence’ is a key feature of ICT consumer marketing. The practice is also rampant for PCs, particularly using the leverage of operating system updates to sell more power hungry machines.

Growth of electricity consumption by small electrical and electronic devices has been the most rapid of all appliance categories over the past five years. It represents about 15 percent of global residential electricity consumption. As shown in Figure 7, a seven-fold gain is expected in Europe over the period 1990-2030, for the residential sector for consumption by ICT and consumer electronic equipment. Further key environmental areas of

Figure 7. Estimated electricity consumption by ICT and consumer electronic equipment in the residential sector, by region, 1990-2030



Source: IEA, 2009

concern with ICTs include:

- **Energy and materials used in manufacturing that contribute to GHG emissions, and also the packaging and logistics of distribution of products**
- **Energy and material consumption during use, with possible health effects on users**
- **Disposal at the end of useful life: landfill and incineration with toxic waste as well as health hazards, for workers in recycling and for the general public**

For ICT energy consumption on the business side, corporate data centres are of particular concern. Overall, data centres are massive energy users, amplified by cooling demands. Inefficiencies in power distribution within the data centre may also increase net load by 100 percent (Hölzle, 2005) as only 50 percent of the power may reach servers. In Germany and the USA, the IT sector – largely data centres – consumes some 1.5 percent of all electricity. In the USA, data centre consumption increased by 100 percent between 2000 and 2008. Estimates for the UK are higher (Symantec, 2008; IEA, 2009).

There is a key question for green ICT policy

Europe needs to put policy in place to address problems of climate change, which act globally rather than just regionally. The key question is:

How can ICT contribute to development of a sustainable world?

If we look further afield, for instance to Korea and Japan, ICT policy is now clearly being directed towards the green agenda. It raises the prospect of using ICT to pursue both short-term economic priorities as well as long-term sustainability goals.

Policy solutions to drive sustainability

The policy answer is increasingly being seen as some strong combination of the Knowledge Economy and a ‘Green New Deal’. It means putting together economic recovery, by the creation of new ICT markets that address the environmental crisis, with the need to move up the value scale, to a knowledge economy. If it works it could be a judicious policy move, in that one problem (global warming) is used to solve two others – climbing out of recession and moving Europe up the value scale to compete globally. Such an initiative should be aimed at first mover status into new ‘green’ export markets rather than just dealing with internal environmental problems. This sets the policy goals:

POLICY GOALS FOR 2015

- A stimulation programme for application of ICTs in energy saving roles across all relevant industry sectors
- Ensuring ICT is used in more sustainable behaviour patterns by citizens and business
- EU production of a next generation of green ICTs with new technologies and usage patterns – as an opportunity for Europe

It is well to note that in the Asian policy analyses, the position of Denmark in wind turbines is highlighted as an example to follow from a strategy viewpoint. The big 'win' would be to apply ICTs prudently for major energy consumers in other sectors, as shown by the approximate global estimates in Figure 6.

Note that these values may underestimate savings using ICT in new patterns of behaviour. Specifically, substitution effects of daily mass ICT use by large numbers of people may yield greater economies over the long run, if properly organised. Examples are impacts of substitution for travel and its infrastructure, also office buildings, etc, due to the causal chain of secondary effects. For instance, use of teleworking instead of daily commuting to work and teleconferencing for more distant travel on a mass scale could reduce the transport infrastructure, usually sized for peak use, as much as commuting's demands for materials and energy. However, one interviewee noted that the *rebound effect* should not be ignored – that under specific conditions, greater efficiency means greater consumption (and greenhouse gas emissions) so reducing the net savings. For example, more efficient cars mean that some people drive further for the same spending on fuel, so some benefits are lost (Polimeni et al, 2007). Thus a more complete model of savings and consumption is required, especially where ICT substitutes for other practices, eg teleshopping.

Also, policy to implement the solutions must have the goal of making the majority of people understand the consequences of selfish patterns of ICT usage behaviour in order to accept the consequences of public policies. In this sense, building the knowledge society is a prerequisite for sustainability. Generally, we can categorise ICT impacts as being of four different orders as shown in Table 1 which should all be implemented in policy terms.

Note that to measure the effectiveness of policy we need metrics. Thus the fourth order effect is to use ICT to measure climate change in standardised approaches

Table 1.
Classifying ICT sustainability impacts

Order of effect	Impact	Effect type
1st order effects: production & use	Impacts due to the physical existence and use of ICT plus the manufacturing processes involved, eg pollution and energy to manufacture and for disposal, etc.	Negative – aim is to reduce impacts
2nd order effects: ICT to cut energy/ pollutants/ water consumed	Impacts and opportunities created by the application of ICT to optimise unsustainable consuming processes, ie power saved by use of ICT in applications. Effectively the analysis examines the sustainability balance, eg comparing what energy would be required if the application had to be done without use of ICTs.	Positive overall usually
3rd order effects: substitution for lifestyle practices	Impacts due to the aggregated effect of large numbers of people using ICT over medium to long term as ICTs can have substitution effects, eg for physical travel, saving on travel, road congestion, with knock-on affects, in road construction, etc.	Positive
4th order effects	Improve society's overall decision-making capacity to implement sustainability policy, with metrics to measure impacts in real time.	Positive

to make observations and accounting for energy consumption and emissions in real time (European Commission, 2009c).

Overall, to achieve the 2015 goals, we envisage five key policy actions. In selecting these items for implementing policy, two basic principles were followed. The first is that the EU's ICT sector must demonstrate leadership on climate change while EU and Member State governments must provide the optimum regulatory context, beyond product-level directives on hazardous substances (RoHS) and recycling (WEEE). The second principle is to focus on an economic boost for Europe – an opportunity for a 'Green New Deal' via a green ICT product industry and market, to stimulate the whole EU economy.

This requires policy actions to set up and mobilise the industrial support necessary, including R&D for new industrial control systems for heightened sustainability and for eco-efficient ICT products. Demand has to be created through both regulatory push and customer pull, first through awareness and then incentive programmes. Encouraging sustainable ICT use, either by substituting ICTs for energy consuming processes or new ICT usage configurations such as cloud computing, are such a measure. Then come the 'bottom-up' savings, in software, consumer devices, network elements, or semiconductor components, up to the level of complete data centres but all following the principle of product leadership globally. Funding for going further than R&D will be needed, taking innovation from prototype to production, especially for SMEs, as well as tax incentives for both production and consumption.

For rapid mobilisation, long-term finance will be required. The potential creation through re-orientation of the European Investment Bank of a European 'bank of green ICT reconstruction' is floated as a focus for discussion to achieve this Green New Deal. It would need to have specific aims and terms of reference suited to fostering all facets of the green ICT sector.

We will need a whole industrial programme for sectors other than ICTs, developing and marketing technologies, processes and services to reduce emissions, toxics and water use across all sectors,

A further initiative could be a programme to evaluate and drive substitution mechanisms. It would focus on introducing, promoting and exploring the optimal choices, in sustainability and economic terms. This would be done by examining social and working behaviour patterns and also evaluating the causal chain for the common mechanisms, beyond the direct impacts, eg into physical infrastructure energy and pollution costs. There is a need to implement new lines of human behaviour research on these problems, specifically *behavioural economics*, to attract people to

opt into, not to opt out of, substitution schemes.

There is a need for a Green ICT Policy Research Unit, an industry-academic partnership, to coordinate green ICT measures with other sustainability efforts. A key task would be to identify barriers preventing development of ICT-based solutions to save energy. Promotion of green ICT business models would be one of its roles. It could also initiate campaigns to take in a wider audience – ideas from citizens and SMEs on sustainable ICT actions. To coordinate the whole, an EU office of Green ICT is proposed, perhaps formed from existing i2010 entities, with an extended remit.

POLICY ACTIONS

- **Stimulatory financial programmes with profit sharing to introduce new low power ICT technology, devices and practices: a) R&D programme for ICT-enabled lowered emissions; b) post-prototype funding for industrialisation**
- **Incentives for more sustainable business solutions, eg via cloud computing, virtualisation, etc.**
- **Government procurement programmes to kick-start market**
- **EU funded programme for developing an EU-wide monitoring system, which integrates existing subsystems**
- **R&D and production support for novel control systems**
- **Stimulatory large-scale demonstrators in public services and in industry applications – with profit sharing on results**
- **Sociological research on teleworking/teleshopping with existing research centres, under a Green Policy Research Unit**
- **Green working life demonstrators**
- **Tax breaks for companies and for home offices using substitution**
- **Set up and fund with cross Member State, European Commission and environmental agency support, an EU Office of Green ICT with its research unit.**

4. Next Generation Infrastructure: Balancing Investment with Competition

KEY ISSUES

- What will the future ICT 'infrastructure' be?
- Regulation to correct an unbalanced market
- Internet governance and ISP regulation
- Encouraging investment vs open competition

What do we mean by an infrastructure for 2015 and beyond?

Traditionally, ICT infrastructure was seen as copper wire hung on poles or in buried ducts providing voice only. Its construction, ownership, funding, governance and regulation were focused by that function. But the knowledge economy requires that we define ICT infrastructure as encompassing anything which lies below applications at the end-user level, as shown in Figure 8. So the internet and the Web, as the human interface to the internet, became part of our infrastructure. Arguably this extends even to application interfaces and standards.

Since our future world will increasingly rely on a global online environment built of software, so Europe needs to take more interest in its governance, structure and key components. Europe must address both the traditional infrastructure updates, eg next generation networks (NGN) providing high speed broadband, and new elements of infrastructure.

Currently there is a dual regulatory approach to infrastructure – *ex ante*⁷ for some networks and *ex post* for the rest. But is this the right set of tools and are they

⁷ *ex ante*, refers to regulation being applied before an action. In contrast, *ex post* refers to regulation that is applied after an action. Typically telecoms regulation is *ex ante* – it sets rules to define what is a permitted action, eg operating in this spectrum band is allowed. However competition regulation is typically *ex post*, with investigation after a possible abuse of the relevant laws.

Figure 8. Future infrastructure as a layered architecture

Key infrastructure layers for today	Applications and content Application level interfaces/standards.
Key for the future	Applications enabling services- search engines, messaging, etc via ISP s and portals service providers. Access utilities and standards-Browsers, OS, Media format, meta data, etc (mobile) web- interfaces to the internet.
Key for today	Internet- Open networking protocols routing; directories and addressing.
Key for yesterday	Physical network- connection/switching for voice/ data, mobile & fixed.
Key for today	Hole in the ground with ducts; mobile base station real estate and spectrum licences

being properly deployed? We start with the fixed network update towards broadband access, often seen as a key general purpose technology driving productivity growth (OECD, 2006), as well as being a consumer service. A high-speed replacement for the investment sunk in the copper network creates a dilemma for regulators. If it is to be built, then operators must invest tens of billions of euros into NGNs but the decision on just when to invest rests largely with them. If required to open their networks to others, they are more likely to delay the roll out. Do we sacrifice competition to encourage build, or else risk possible delay by imposing open access requirements so service competition is possible? Also, if the benefits of mobile broadband are ignored, we risk spending too

much on a set of high cost national fibre networks. As Commissioner Reding noted recently (Reding, 2009), the last thing we need is a new set of national monopolies. Moreover, government support for a particular fibre optic solution is equivalent to picking ‘technology winners’ – rather hazardous. So how does Europe build NGNs in a way that properly exploits the Single Market for infrastructure? In the background is a failure to establish a broadband mobile market which anticipates the capacity of wireless technologies to straddle national boundaries with data and voice.

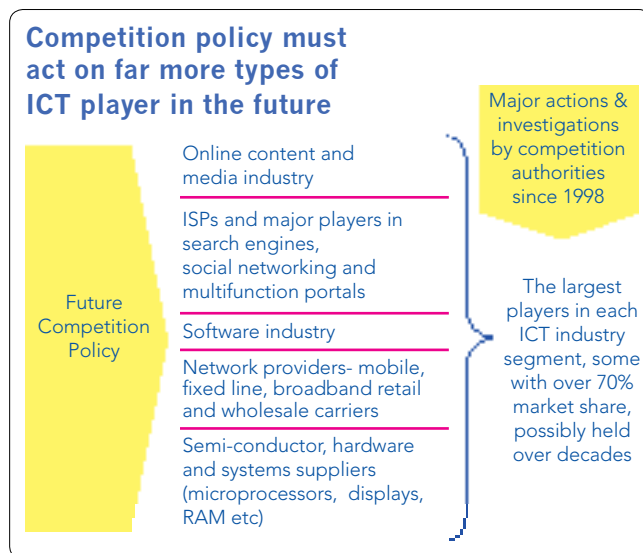
As infrastructure becomes more complex with more layers, we discover ever more issues, particularly owing to market dominance factors. There are major problems with software markets, which also touch the internet at browser and operating system and enabling service levels. This apparently arcane area is now critical, as our dependence on these upper layers increases daily. However, Europe’s competition-enforcing process is too long and uncertain.

Software markets are peculiarly open to distortion through a combination of the network effects and a cost structure characterised by increasing returns with volume without limit. The ICT industry is unusual in that dominant market shares (perhaps 70-95 percent) may be maintained for very long periods, as much as three decades. Today such dominance is addressed only via an *ex post* competition policy, not only for software and search engines, etc, but also for content, ICT hardware and increasingly for networks (where the number of markets subject to *ex ante* regulation fell by two-thirds in 2007). More effective forms of ICT competition policy needs to be realised for all the areas shown in Figure 9. These upper layers are market segments which do not involve ‘natural monopolies’ but which have been left open to market dominance, largely ignored by regulators as being too technical. The stranglehold on the market is often via intellectual property rights for formats, software mechanisms, code and interfaces.

Consequently, Europe lags not only in making the building blocks on which the ICT world and the internet are based, beyond networking, but also in using them, because competition authorities move too late. Actions occur after a succession of competitors have been ejected or weakened over many years. Then the European Commission or a national competition authority (NCA) may begin investigations.

Many years later, after the rewards of market dominance have been enjoyed, there may be a fine, which represents a comparatively small penalty for the returns

Figure 9. Competition policy must have a perspective aligned with market realities in the ICT industry



made.⁸ In the meantime, unseen, the benefits that end users would have gained from effective competition are denied. Heavy-handed intervention might possibly stifle innovation so new entrants’ and incumbents’ views must be weighed carefully. Moreover, certain critical pieces of hardware, such as microprocessors, are like software in competition terms, in that the implementation of the inherent processor design uses an instruction set, which is proprietary and so has IPR restrictions.

Effectively, the European ICT industry has been stunted by poor competition policy. The sector is now dominated by the major global players, largely American (eg Intel, Microsoft and Google) prompting the question – has damage been inflicted on the European ICT industry through inactivity of governments to protect fair competition?

For the future, we should also examine governance of the internet, as it has grown into a crucial economic and social foundation. So far, internet governance has worked fairly well but now it demands careful reconsideration. What should Europe be doing to establish governance processes for this enlarged concept of infrastructure? A review is needed of regulatory policy and practice for providers of internet connection, email and portals in

⁸ eg in the Intel case, the European Commission’s ruling and fine of 13 May 2009 for abuse of a dominant market position (Article 82) came nine years after the first complaints (Europa, 2009). Note that the sums are large. The European Commission gave the value of the x86 CPU market as worth €22 billion/year and so fined Intel €1.06 billion. Microsoft has also been fined by the Commission on several occasions for competition violations with the same order of fines.

order better to protect end users. Commonly enforceable EU controls need service level agreements on ‘internet dial tone’, email, spam controls, malware distribution and privacy issues, especially profiling.

Forming the standards for ICTs in general is problematic because, as one interviewee from a consumer organisation noted:

The standards process is not transparent but controlled by informal negotiations between suppliers. It tends to be dominated by the supply side so an open level playing field is unachievable, because the consumer, the demand side, has not contributed. Interoperability of software is a major facet of this – should it become an entitlement? If the product label says it is interoperable then to the consumer it must be. It is a citizen level as well as a consumer issue.

There is an urgent question

Consequently the key question for infrastructure is:

How do we shape infrastructure development, specifically the competition policy that combines rigour and speed?

This is becoming more urgent. Infrastructure issues need to be resolved rapidly as our dependence on ICT is much greater than, say, a decade ago. By 2015 our dependence will be higher and by 2020 it will be higher still.

Policy level solutions for the next decade

Goals for future policy follow the infrastructure layers:

POLICY GOALS FOR 2015

- **A new regulatory regime based on more effective *ex ante* regulation across all ICT layers**
- **Open source software and open standards for ICT infrastructure and public procurement**
- **Strong internet governance participation, by Europe, its citizens and businesses**
- **Ensuring a next generation connectivity level infrastructure can be built in a competitive market, as a hybrid of radio and fixed communications**

Solutions for infrastructure development will always have to rely to the maximum possible extent on properly functioning markets. However, far more rapid, stronger and effective intervention in markets will be necessary to create such a level playing field. Looking internationally we see few adequate models in the USA, Japan or elsewhere to follow. *Ex ante* regulation may have to be brought in, possibly invoked at thresholds of market

power, to counter exploitative abuses made possible by network economics and exclusionary conduct based upon denial of access and proprietary standards, ie a misuse of intellectual property rights. It must be easier to open investigations. Provided regulators and governments recognise that there are trade-offs between investment and competition, the access regime and speed of roll out, etc, the problem can be addressed.

The next policy priority is in the software layers, where open standards, open source software (OSS) and competition in the software industry for the upper layers. Open standards are a major issue for the upper infrastructure layers where proprietary IPR dominates, as Europe is dependent on software (IPITS, 2004). Also OSS has a critical role as being the only way we can build a common infrastructure, as in its highly successful basis for the internet. OSS will have to be the foundation of the key ICT platforms, through the first part of the current century. But in the EU, OSS is not favoured enough for public procurement, despite initiatives such as the European Interoperability Framework, a useful blueprint for pan-European compatibility from semantic to network levels. A more level playing field in software markets could be achieved by requiring OSS exclusively for public procurement. Interestingly, commercial paid-for software in the EU has not carried any liability for malfunction. Introducing liability could have two effects –justifying the payment and assuring much higher software quality.

For internet governance, there is a need to find a middle way of openness. It does not involve heavy government control, with politically influenced multilateral oversight, infighting and censorship (eg China’s “Green Dam” proposals to curb pornography). Rather it must protect businesses and the individual. What needs to be introduced is fair governance by and for the citizen which implies a set of managing components – a body with authority, through laws, able to apply sanctions with a jurisdiction that extends globally. Guided by who will be the future users, their needs and vulnerabilities, this requires a blueprint for a new governance scheme. It should be in line with concepts of freedom of communication being a human right, and respect for privacy and safety. A new community model of internet governance might be built, whereby users have a true voice, as a form of user self-governance. Setting up a permanent policy unit to define, design and pursue the latter two initiatives may be useful in forming a plan for mobilisation at an international level. Any future internet management structure should be fast-acting, not bureaucratic. It

needs to be urgently applied in going for the jugular in internet problems – creating an internet which is safe and secure.

A question following from the regulatory reforms on competition is how should EU regulators deal with NGN access (or NGAs)? One strategy in Australia,⁹ New Zealand and Singapore is for government to invest in the new open networks itself. This could also be part of the economic recovery plan. Such schemes involve a partnership between the private and public sectors. Still, questions remain over which technology should be used, eg fibre to the home, cable TV, or radio using digital dividend spectrum released by analogue TV switchover.

It would be a mistake to restrict NGNs to redevelopment of an incumbent's copper network, as the goal should be infrastructure competition in the wholesale market. Any technology that meets demand should count as an NGN – an innovation opportunity for Europe, be it radio, satellite or cable TV. A harmonised spectrum policy could offer significant benefits here, for instance, making digital dividend spectrum available for fixed or mobile radio access across the EU would allow pan-European services to be developed. Steps are being taken, but not urgently, to create a European level spectrum policy. This should include removal of restricted competition via the protection of national markets. Removal of regulatory barriers to the development of pan-European services is a priority. The future reality for NGNs is probably a mix of technologies, eg a fibre core and several access technologies, led by mobile and fixed radio links (OECD, 2006). Policy actions to achieve goals are summarised below:

POLICY ACTIONS

- **Introduction of *ex ante* regulation regime for all ICTs, with accelerated processes for decisions**
- **Investigation of market practices with lower thresholds for starting activities**
- **Emphasis on open solutions for funded ICT infrastructure projects**
- **Public procurement rules with OSS preferences**
- **Funding support for new OSS infrastructure platforms in software development programmes for**

Europe

- **Stimulatory large-scale demonstrators in public services and industry applications**
- **A more inclusive approach to internet governance with creation of an EU entity that may participate in a global body rules with authority. That EU entity should have a community-based remit.**
- **Common EU enforceable regulation with service level agreements for ISPs and portal providers.**
- **Harmonised EU spectrum policy**
- **Release of the digital dividend for broadband wireless connectivity**
- **Private public partnerships on investments**
- **Ensure infrastructure competition**
- **Separation of services and network provision for NGNs**
- **Vigorously deploy competition law with accelerated processes.**

9 The Australian government is attempting to deliver a part of its recovery stimulus of 2.6 percent of GDP (Knight, 2009) with its €24 billion investment for a national broadband network

5. Soft Infrastructure: Investing in Social Capital

KEY ISSUES

- Understanding the critical role of soft infrastructure
- Balancing sectoral and integrated ICT policies
- Avoiding failure in the massive ICT projects involved
- The challenge for our knowledge society

The knowledge society is founded on a 'soft infrastructure' of key institutions, often loosely termed 'public services'. This layer of infrastructure may be considered as equally important as the hard infrastructure that connects and delivers content. It consists of investment in intangible assets, the basis for the social and human capital of Europe. It is those institutions and services that produce intellectual capital as a socio-economic resource, shaping Europe's society and culture. Moreover, the soft infrastructure is at a point of transformation in access and efficiency by judicious implementation of ICT. If a suitable ICT policy can be formed and implemented, we may expect ICT-enabled versions of:

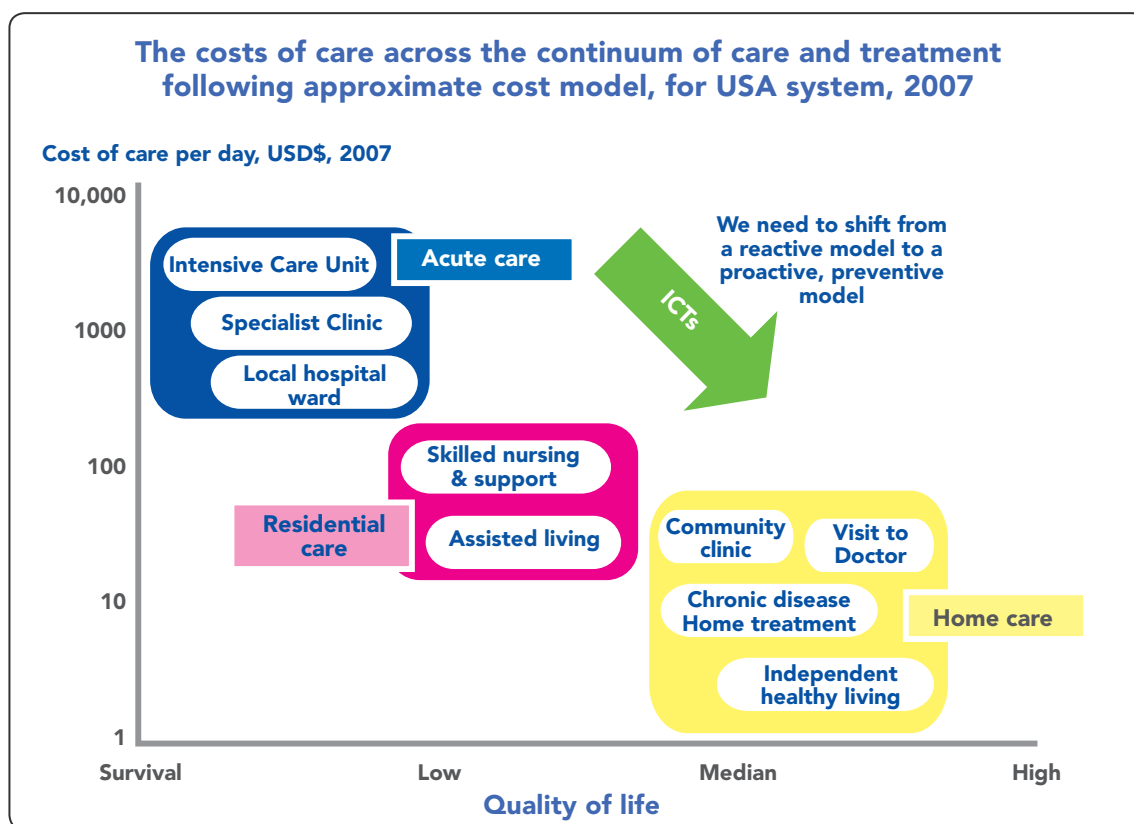
- Health services
- Sheltered care with independent living for older people – closely associated with health and educational levels
- Education and training for all levels and all ages
- Educational support for digital inclusion – for a future online world for all citizens – is one part of the soft infrastructure.
- Civil and criminal justice systems to support legal processes
- EU-wide emergency services at an everyday operational level for major catastrophes

A soft infrastructure policy seemingly implies an integrated ICT policy problem and solution. In fact it is also a sectoral problem – for instance, eHealth could be part of the health sector policy, not of the ICT policy. Soft infrastructure components having a national foundation include primarily health services, education and systems of justice. Creation of new delivery mechanisms will challenge existing power structures and working practices. There is also the argument that the 'death of distance' brought by such systems will challenge the national organisation and funding (eg a telemedicine diagnosis might be set up from anywhere in the EU) while any EU-wide service faces the dividing problems of language and working practices.

But there is a sense of urgency. The European population is ageing rapidly but health care systems are already overburdened and racked by cost increases. In the EU, while some 17 percent of the population will be over 65 in 2010, it will rise to 21 percent by 2020, a trend that will continue beyond 2050. Ageing is a significant factor on health expenditure although health care costs are correlated with proximity to death rather than age. In other words, the pressure of ageing on health expenditures will be partially offset by the postponement of death-related health care costs (Seshamani and Gray, 2004). The pressure on national budgets (see Figure 10) for health can also be relieved by using ICT constructively, eg for care for older people in the home.

Increased public spending to support the elderly (above 70 years) is likely to be significant, amounting to between 4 and 7 percent of GDP, varying by Member State (European Commission, 2009d) as public spending on long-term care will grow, as the very old (aged 80+) will be the fastest growing demographic class in the near

Figure 10. Comparing the costs of acute, residential and home care



Source: adapted from Intel, 2007

future. But the total cost of ageing is higher – in the Eurozone the costs of all age-related spending (pensions, health care, residential support, disability benefits, etc) are 15-25 percent of GDP (Magnus, 2009). Sheltered care and assisted living will be increasingly necessary as the number of older people rises in the EU. It could also provide better health care, enabling a rise in retirement age. Active life will extend with better health care and better health. Quality of life is, perhaps, the major determinant of a person's state of health.

Pension provision in the EU faces similar challenges. The recent economic crisis has exacerbated the difficulties in the short term as equities sink, reducing invested value. Yet final-salary contributory pension schemes increasingly are halted. The budgetary impact of ageing will be felt more sharply in the EU; the OECD estimates that only 39 percent of those in Europe between the ages of 55 and 65 are in work while the workforce is likely to shrink over the coming decades, unless working lives can be significantly prolonged (Magnus, 2009). Employment rates of older workers could grow as reforms prolong working life. With failing retirement plans, increasing care and health

costs, the place for ICTs as a generator of new work and to support the elderly in extending working life has never been stronger.

However, when we turn to ICT as a way of improving services and active life, we face a key problem – the human interfaces. Sophisticated use of education, health and justice services must be intuitive and accessible by all on an equal footing. ICT-based soft infrastructure services will require far more efforts for eInclusion, digital literacy and gaining the confidence of those least able to comprehend the new online world perhaps, older people and those with special needs.

We also have to overcome some initial failures, such as those eHealth systems focused on building databases of electronic medical records for patient administration systems. There is a crucial lack of understanding of the sociocultural dimension. A change in the culture of the medical profession itself is necessary, as well as better privacy protection and improved interfaces of the applications for both staff and patients

The knowledge economy and society rely on intellectual assets based on each person's original

education and training. In some ways we are now returning to the 1840s when only 10 percent of children in the most advanced countries went to school for a brief secondary education. But now the challenge is degree-level education. We can only achieve a knowledge economy through a major expansion in tertiary education. Already, education accounts for significant proportions of GDP in OECD countries, 6.3 percent on average. Spending is generally growing in higher education with more people, although there are large variations between countries (see Figure 11).

The differences pay off in disposable income throughout life and thus standards of living. The gap in incomes is reflected in the gap in knowledge skills, specifically in degree level qualifications. There is a large earned income impact from educational levels, as shown in the figure. In Hungary, for instance, university graduates enjoy a 117 percent earnings premium over those with secondary school education. In some EU

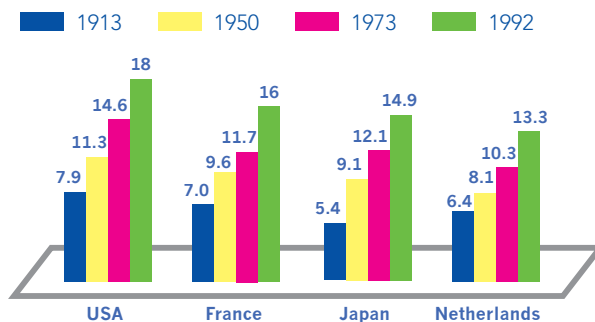
states such as the UK, the income gap is widening so that social mobility is declining as higher education levels peak. Consequently, eEducation comes into its own as the foundation of the knowledge economy, if it can bring expanded numbers into higher education at lower cost, eventually aiming at higher education for all who want it. To move into eEducation on a large scale we need a highly inclusive society in ICT terms. eInclusion means far more than physical internet access – we must combat technophobia with training to use digital devices – and far more action than the Riga Ministerial Declaration of 11 June 2006 to prepare for a European eInclusion initiative. As one interviewee from the Obama administration transition team remarked:

We need much more education freely available to be able fully to exploit our lives online and offline. Our world is becoming far more complex and we need more training to be able to cope.

Another major institution in need of reform due to

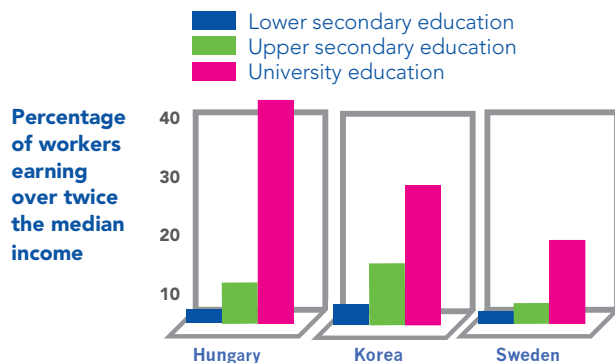
Figure 11. The rise in graduates and earning power

Rise in the average number of years of education per adult



Student numbers have multiplied with progress - UNESCO estimates that in 1900 there were 0.5Mn university students globally; in 2000 there were 200 times more, some 100 million. In the future, there may need to be far higher numbers qualifying in the EU if we are to move towards a knowledge economy

Source: Monitoring the World Economy 1820-1992. OECD and OECD insights - Human Capital, 2006 <http://puck.sourceoecd.org/vl=726855/cl=34/nw=1/rpsv/humancapital/index>



Earning power of graduates

Graduates' earnings for a significantly large proportion are over twice the national median income. Those who leave school at 18 also earn more than those who leave school in earlier years (figures for 2004)

Source: Education at a Glance 2006. StatLink Download StatLink File also has information for other OECD countries at: <http://dx.doi.org/10.1787/815010258467>

spiralling costs and inefficiencies are our systems of justice, which are all highly individual to Member States. These are the civil and criminal justice systems to support legal processes, especially the courts and prosecution procedures that are crying out for ICT investment to increase efficiency. However, there are signs that reform has started, as in the UK's €2.2 billion criminal justice IT system (Wallace, 2008).

Going further than critical ICT infrastructure protection (see policy area 9) is the institution of the emergency services for first responder duties and their everyday activities. With a myriad of national systems, there is still the need to be networked for EU-wide working for major catastrophes, with common EU standards and processes.

There is a key question for European growth

Building the soft infrastructure with ICT is both a social necessity and an economic opportunity. For example, sheltered care, through telecare, has a potential triple benefit for the economy:

- **More older people stay active, in work for longer earning and productive for longer in life.**
- **Cut costs of sheltered care while improving health – cutting rates of more serious intervention.**
- **New business opportunities for European industries.**

Overall, soft infrastructure elements of society could form and catalyse the whole EU knowledge economy, a stimulant in times of recession, as part of the 'Green New Deal', seeding sustainable products, services and business processes. Longer term, if the EU wants to compete globally, it has no choice. Strong investment, especially in education, is necessary for the EU to move up in the global knowledge economy stakes, to a degree-level workforce. Note that income levels in the EU will also progress with higher educational levels – bringing larger tax harvests. The soft infrastructure provides the ideal platform for large demonstrator projects, and opportunities to employ SMEs – via procurement policies – while fighting recession. National budgets for the essential services will all benefit.

The key question is – *how to reap these benefits?*

A soft infrastructure policy for Europe

POLICY GOALS FOR 2015

- **Setting up a build-and-rollout programme for each service which resolves the sectoral and national**

barriers in a constructive way

- **Ensuring investments in the new generation of services would stimulate the EU economy by advancing knowledge-based industries in both the public and private sectors**
- **Use of green ICTs with new technologies and usage patterns – as an opportunity for Europe**

In changing nationally fragmented systems of education and health, we may encounter resistance for reasons of budgets, national interests and cultures. Thus any policy must be long term, perhaps over a decade or more, for services such as education and health. Moreover there is a more fundamental question of ICT policy as the platform for change as against a sectoral one. In the light of this, policy could be aimed at a parallel or auxiliary approach, ie offering European-level additions to national institutions, which can be taken up on a voluntary basis by the Member States. Augmenting national resources and eventually providing more and better services but at a shared cost would be welcomed, in a gradualist approach – rather than a revolutionary transformation. An action plan for the EU in soft infrastructures can be seen as series of steps:

POLICY ACTIONS

- **Identify key candidates for the soft infrastructure services and create a vision for the whole soft infrastructure, across all services, and for each service. NB Each soft infrastructure service will be a large-scale Europe-wide undertaking, with payback timescales of perhaps over a decade for full implementation.**
- **Analyse funding needed and payback expected in a cost/benefit analysis at top level. Set up funding – possibly from the EIB or initiate a special EU recovery bank designed for soft ICT infrastructure project funding in the long term.**
- **Set up and fund teams for designing, piloting and rolling out the major services.**
- **Design a mobilisation programme for each soft ICT infrastructure service (health, education, etc) starting with needs analysis.**

6. SMEs and ICT: Supporting Europe's Small Enterprises

KEY ISSUES

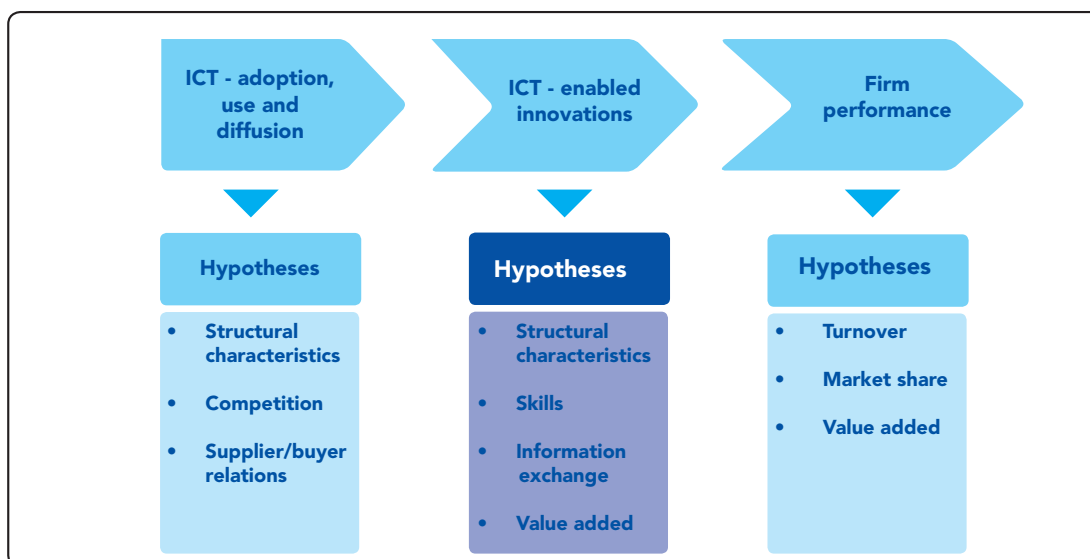
- SMEs are the engine of the EU economy but lag behind large firms in ICT use
- ICT adoption is associated with productivity and innovation
- SMEs need support, especially those with potential for growth and innovation

The importance of small enterprises

Small and medium-sized enterprises (SMEs) dominate the European Union's economy, make up 99 percent of businesses, provide two-thirds of private sector jobs and create most new jobs. More than half of the EU's private sector workers are employed by micro-

enterprises (those with fewer than 10 employees) and small enterprises (with 10-49 employees). The average European company employs just five people. Thus SMEs are the engine of the economy, and their success is critical for economic growth. The take up of ICT by enterprises of all sizes is growing, but one issue for the knowledge society is that small enterprises are lagging behind large firms. For instance, while 96 percent of large enterprises had a broadband connection in 2008, 79 percent of small enterprises had one. There is also a wide variation in the take up of advanced applications that are associated with higher productivity: in 2008 only 14 percent of small enterprises received orders online compared with 33 percent of large firms (Eurostat, 2009). We can think of this in terms of an ICT value chain with three main steps as illustrated in Figure 12.

Figure 12. The ICT value chain and its contribution to firm performance



Source: e-Business Watch, 2008.

The adoption of ICT matters because ICT use is correlated both with productivity and with innovation in general (i2010 High Level Group, 2006). At the first stage, there is a correlation between ICT adoption and use and characteristics such as the degree of competition that a firm faces or the nature of the contractual relations a firm has with its suppliers and buyers. Clearly, individual firm characteristics such as size will also affect its decision on ICT adoption. Then, once a firm has adopted ICT, ICT-enabled innovation becomes possible. But the ability to turn investment into innovation depends on several factors, notably the availability of skills, supply chain management, and organisational changes such as outsourcing.

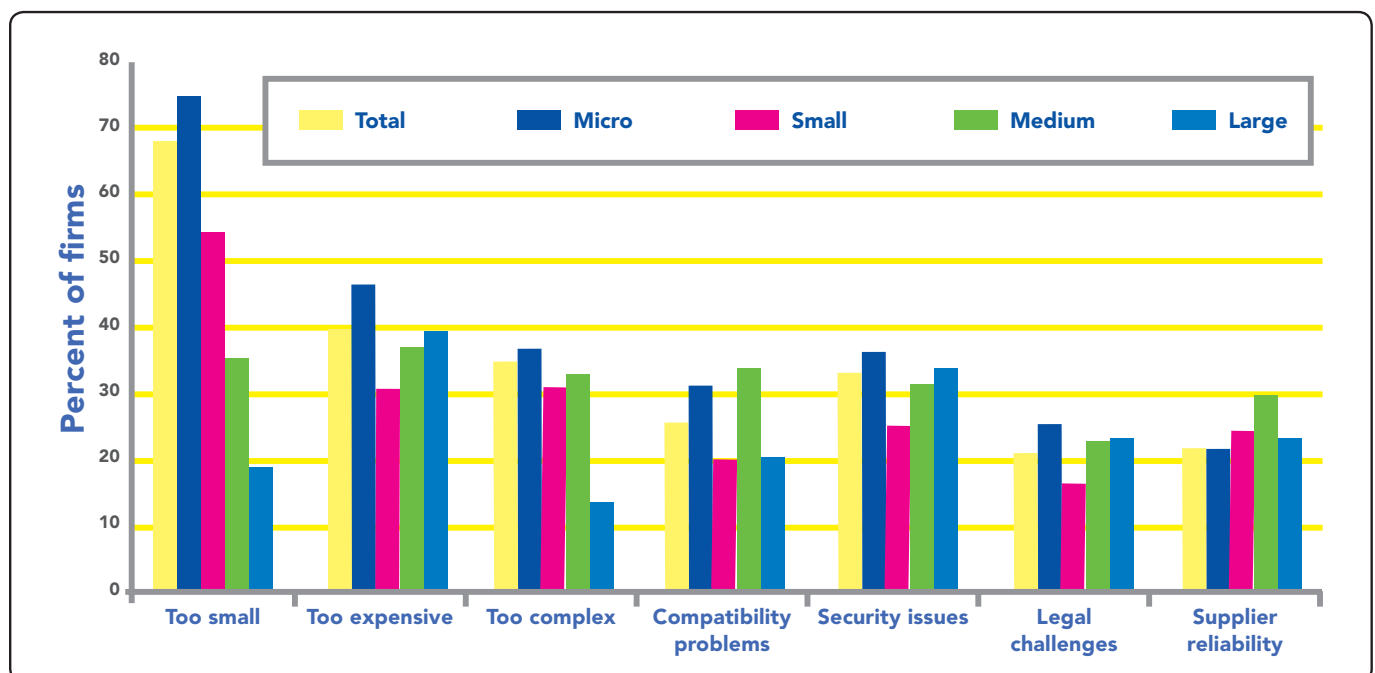
Aggregating these firm level changes enabled by ICT will feed through to productivity growth at the macro-economic level. Thus unless small enterprises are assisted with the adoption of ICT the value added benefits will not feed through to the economy as a whole. Of course the contribution of ICT depends to some extent on the nature of the enterprise. Europe's SMEs are very diverse, ranging from very small and traditional, family-run businesses, operating in local business environments to fairly large and dynamic, innovative companies with international customers. It also includes Europe's start-up companies, potentially with huge growth potential

but typically fragile in their early days. The European Union has done much to focus attention on the particular challenges faced by SMEs in a wide variety of areas but there are huge differences in the capacities of firms with over 200 employees and those employing 20.

Small enterprises (employing up to 50 people) and micro-enterprises (employing fewer than 10) are especially heterogeneous, with high-tech knowledge-based firms at one extreme and corner shops at the other. On average, innovation intensity is generally greater in larger firms, and of course we should recognise that SMEs often thrive as suppliers to large companies. Not all small firms are innovative or possess the aspiration and potential for high growth. It is important therefore to identify the factors associated with innovative small firms so that promising small firms can be nurtured and supported, maximising the chance that they will grow into tomorrow's large companies.

In their start up phase, they are often fragile, living hand-to-mouth, operating at a loss while building their businesses. They are also particularly vulnerable to competitors who introduce new products or services, or become more efficient through improved production processes, because they may lack the resources to respond quickly. For small firms in the EU, raising finance to

Figure 13. Perceived barriers to eBusiness by enterprise size



Source, adapted from European Commission, 2007

establish a new business or grow an existing one can also be problematic.

Administrative tasks become more burdensome the smaller the firm, and recruiting staff with the right skills and the expected flexibility takes time and is more of a commitment for a small firm. It is perhaps understandable that decisions to invest more in ICT are often not seen as an immediate priority.

How can we better support small firms?

How should the EU address this problem? We need to understand the particular needs of SMEs, especially for small enterprises employing less than 50 people, and understand the obstacles they face in adopting ICT. Surveys show that the main barriers to adoption of ICT for micro and small enterprises are the perception that the company is too small and that the technologies are too expensive and complicated (European Commission, 2007) (see Figure 13).

However, this should change as technological developments make adoption more cost effective. Developments including grid or cloud computing, Software as a Service (SaaS) with services residing on remote servers, and faster and cheaper connectivity, are making it much easier for SMEs to adopt advanced services. SaaS technologies, which require light or no up-front investments, are particularly attractive to small companies. The rise of cloud computing means that young firms no longer have to buy their own IT equipment. These developments should help improve the ability of SMEs to adopt advanced services, to innovate and participate globally in larger markets. The webification of the supply chain in many industries, from electronics to apparel, now means that even the smallest companies can order globally (Anderson, 2009).

Other analyses highlight lack of awareness of the possibilities and benefits that ICT could offer as a barrier to ICT adoption by small enterprises (DIW Berlin, 2008). More generally, it is well known that management competence and skill issues are key factors in determining whether innovation feeds through to profitability (Hughes, 2001). This implies that more emphasis in policy should be placed on building management competence in SMEs so that the contribution of ICT to performance can be recognised and acted upon. Policy should perhaps also place greater emphasis on developing competence in those enterprises with real growth potential, compared with an emphasis on the promotion of start-ups.

Particularly in view of the importance of small

enterprises to the rural economy, a key question is whether investment in ICT in rural SMEs has a role to play in building a cohesive knowledge economy in the EU. The knowledge economy is currently really an urban and suburban phenomenon and if we are to avoid the steady migration to urban areas in search of employment, housing, services and lifestyles, small enterprises will need particular support as part of the process of 'smart specialisation' (Foray, David and Hall, 2009). Smart specialisation can be thought of as a learning process to discover the research and innovation domains in which a region can hope to excel. ICT has an important role to play in supporting this process.

POLICY DIRECTIONS

- **Policy goals to 2015**
- **Expand / deepen ICT use by SMEs, through broadband, cloud computing, etc**
- **Shift emphasis towards small firms with potential for innovation and growth**
- **More support for rural SMEs**

The knowledge economy demands that Europe's SMEs become more efficient since ICT is a double-edged sword. It offers both new opportunities so that SMEs can compete on a global scale but, at the same time, it also exposes them to global competition as never before. Moreover, we need to be more supportive of those firms that have the potential for real innovation and growth. The underlying premise guiding policy is that ICT is an enabler of innovation and productivity improvements, which in turn have a positive impact on economic performance.

Small firms typically struggle to find the time, expertise and resources to assess and decide how best to invest in ICT, hardware, software and training. The EU's approach to supporting SMEs is to be applauded (eg the Small Business Act was long overdue and gives a real platform to build on). We see a case to pay more attention to the needs of small enterprises (as opposed to SMEs), with an overhaul of the Charter for Small Enterprises perhaps offering an initial step in this direction. There should perhaps be another shift in policy emphasis away from promotion of start-ups and towards developing competence in those enterprises with innovative and growth potential.

Policy needs to be directed first towards raising awareness of the benefits of investing in ICT, and in helping to overcome the perceived barriers to adoption,

especially for small enterprises.

First, that depends on improving core management skills in SMEs, as well as promoting innovation and entrepreneurship through an open innovation platform. Also, experience from earlier initiatives shows that networking is the most successful strategy to raise awareness of the benefits of investing in ICT among SMEs.

Access to high-speed broadband networks is of fundamental importance in ensuring SMEs have the infrastructure and tools to compete in a global market. It is also essential that broadband is available throughout the EU including rural areas to help prevent urban flight.

As indicated, the barrier of cost of adoption of ICT for small enterprises is reducing and firms need to be made aware of how to take advantage. This could be addressed through novel schemes in scale and scope. For example, we envisage implementation of a large-scale initiative, which we might describe as the ICT for rural enterprise scheme. SMEs could apply for matched EU funding or vouchers that would pay for an approved ICT expert for, say, up to 15 days work and advice. This might entail an audit of the enterprise's current situation regarding ICT systems and an outline strategy on the way forward for the company. There is plenty scope for other schemes like this with hands on help for enterprising small firms.

This could be a worthwhile use of the EU's substantial fund for rural development. These funds could also provide, for instance, online training kits providing skills and information on how to use ICT in support of rural businesses, eg in tourism or other service.

Going further than pure ICT investment to encouraging clusters of high technology SMEs through a smart specialisation process, Europe could harness those opportunities offered by the Green New Deal, described earlier in this report, orienting them to the SME community via policy actions.

Improving digital literacy is not only beneficial to SMEs in terms of the availability of skilled knowledge workers but also because some could play an important role in promoting it. In partnership with government agencies and education and training institutions, some larger SMEs could help in training activities, in real and virtual environments. This would contribute further to awareness raising efforts.

Investments in the soft infrastructure, eGovernment and green technologies (as covered in other policy

areas) should also ensure that SMEs are able to properly participate both in research programmes and in public procurement. Whether this requires legislation (eg through a revised Small Business Act) or whether procurement guidelines would be sufficient is something that should be considered.

Policy directed specifically towards SMEs of course dovetails with policy goals and actions described elsewhere in this report, notably on innovation in the knowledge economy, eInclusion, next generation infrastructure, competition and market entry, and the single market. All of these aspects are highly relevant to SMEs but deserve their own objectives and proposals in these areas.

POLICY ACTIONS

- **Build competency in small firms with growth and innovation potential**
- **Raise awareness and improve digital literacy through networking and training**
- **Provide grants for expert advice on ICT implementation**
- **Deploy rural development and other funds to support clusters of enterprising rural SMEs**

7. A Single Information Market: Enabling Cohesion and Growth

KEY ISSUES

- Realisation by Member States of the value of a single market in ICT, including content, and hence the benefits of lifting national barriers
- Creating the single information market in consistent, pragmatic terms across a wide range of policy areas

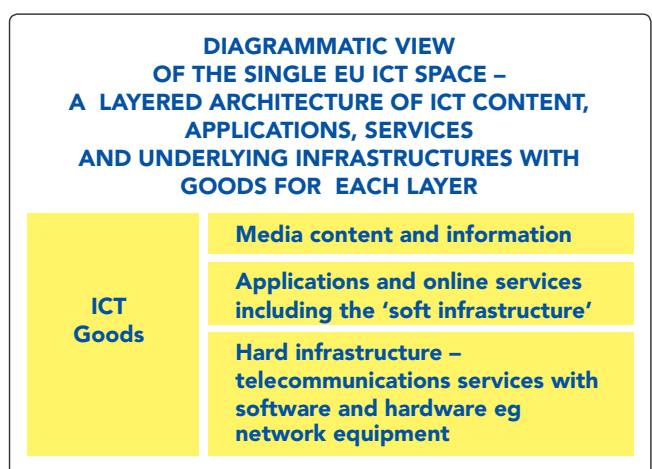
What is a single European market in ICT terms?

Since the signature of the Treaty of Rome, the policy for a single internal market has mainly consisted of removing legal barriers to the free movement of goods, people and capital. Moreover, a *Single European Information Space* – a single market for the Information Society – was one of the main objectives of the i2010 initiative. Now is the time to reassess the possibility of a single market in ICT and what it means from the points of view of both supply and demand as we are still far from that goal. A single European information market for ICT (and its ‘single information space’) may be defined as shown in Figure 14.

National barriers to a single market

The development of single market legislation has outwardly been an important step toward development of the information society in the EU. Today, we face the realities of globalisation, EU enlargement and the spread of the Euro currency zone plus the introduction of certain new ICT which can reinforce the power of

Figure 14. The single EU information market as a layered architecture



society to express itself globally – be it via the Internet or via spontaneous political movements organised over mobile networks, with free exchange of user-generated media content. These new uses have a borderless nature. They provide a critical potential for integrating previously geographically separated markets through eCommerce. They also offer a platform to drive borderless social trends and political movements. However, an internal ICT market implementation is opposed by many vested interests and power structures.

Moreover, there is a lack of an integrated framework. Too many dispersed and non-integrated EU legal instruments and regulations have been adapted or developed over the last decade to create a legal framework

supporting the development of an internal market, with a wide range of legislation and other soft law instruments. They address issues such as eCommerce (European Commission, 2000), data protection, consumer protection, payment systems, intellectual property rights, eCommunications, video and broadcast television, illegal and harmful content, protection of minors, security, taxation, eProcurement, etc. At best they are a fragmented skeleton, facing the realities of:

- **Inertia on the part of Member States and the major industrial players to relinquish national markets.**
- **Complexity of the legal and regulatory barriers.**
- **A limited idea of the future possibilities – few insights or measures of the benefits of a single EU market.**

One problem is that the benefits in real terms are not immediately obvious, especially to those with an entirely national perspective. A concerted effort is needed to evangelise them. One reason for inertia is the complex legal framework for ICT that has grown up over the past two decades. It has legislative overlap and gaps, and it is neither harmonised nor future proof. Simplifying and harmonising the regulatory regime across all Member States would be a step forward. For instance, directives aimed at protecting consumers may overlap with single market legislation or leave out major areas, eg online transactions. The Member States have adopted different consumer protection rules in their national laws, fragmenting the market while adding legal uncertainty. The eSignature Directive, for example, establishes the formal recognition of electronic signatures across the EU. In practice, use of eSignatures across borders is currently not viable since legal recognition of the different kinds of electronic documents at the EU level (export licences, certificates of origin, warehouse warrants and receipts, etc) is not standardised.

However, these are relatively minor issues compared with the barriers to changing the nature of major nationally based services, especially in the public sector. For example, a pan-European tele-medicine service would have to overcome an exclusively national nature of supply, budgets and scope of coverage let alone the difficulties of cross-national payments for treatment. The uneven implementation across the EU of directives on data protection and privacy in electronic communications further inhibits the mobility of patients.

Intellectual property rights are another impediment in several sectors owing to the territoriality of patents

and copyright. The costs incurred in obtaining EU-wide legal agreements especially on content copyright must be reduced.

Progress to a single market, therefore, is unlikely to happen in the short term. Instead we may expect an incremental evolution, differentiated by sector, as indicated in Figure 15.

As shown in the diagram, online services are more universally available across Europe. Basic telecommunications, on the other hand, is likely to remain largely under national jurisdiction for some time to come even though logic might suggest that it should have become a single internal market some years ago.

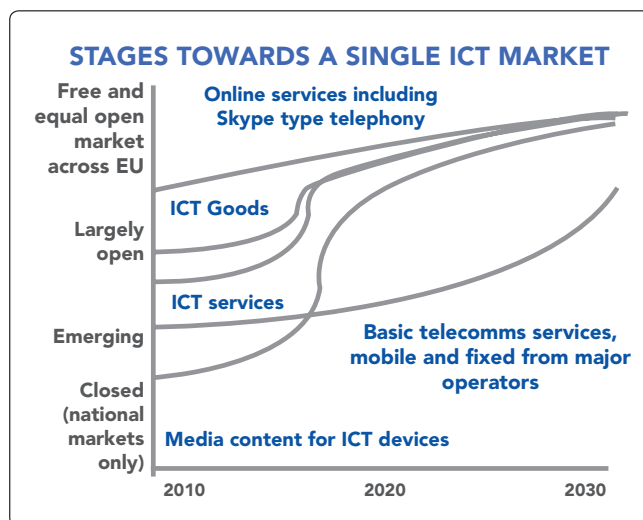
The pricing anomalies across the EU in data roaming should also be mentioned, eg precluding a radio-monitored patient to freely move around in the EU. On this subject, an interviewee from the mobile sector noted:

Effectively Europe should focus on a single market for regulation of the mobile industry – with creation of strategic frameworks for each major subject such as spectrum. At EU level a clearer, coherent, consistent policy of market intervention, both predictable and reasonable, is needed for industry to invest.

Realising the common interest in a single market

Despite having attempted it for over fifty years, the underlying reason for the failure of building a single EU market is that the advantages have not been convincingly shown to people or Member States. The absence of economic integration for ICT (ie by the removal of trade

Figure 15. Slow evolution towards a single ICT market is expected



barriers through customs unions, common currency, some industry standards) is conserving an archipelago of nation states. The question we pose is really for Member State governments to answer:

When will it be realised that the common interest in a coalesced European economic entity is greater than in an individual Member State?

Solutions lie in showing the benefits of sharing and co-ordination

POLICY GOALS FOR 2015

- Demonstrate the gains to all of a single information market in economic terms
- Ensure investments in a single market of ICT goods and services stimulate the EU economy
- Use companion developments for a knowledge economy and green ICT to reinforce the drive

To move forward against the barriers explained above we need to demonstrate the benefits to all, by valuing the gains from a single internal European market, using a cost-benefit analysis.¹⁰ The Public Service Information Directive (PSI) of 2003 is a useful costing example (European Commission, 2009e). Some potential gains from a single market are shown in Table 2. These need to be highlighted, for the Member State governments especially.

Such an approach admits that the experience of the last two decades in building a single market has too often been largely one of failure, due to piecemeal activities pitted against entrenched national agendas for ICT. As one interviewee from a consumer body noted:

A single market is needed with citizens able to access public services seamlessly no matter where they live or work.

Going further, the benefits of the single market are perhaps far larger. They are essential, first in helping to build the knowledge economy by opening the European market to common soft infrastructure services such as education and health, and then to move towards a green economy with EU-wide acceptance of sustainability standards and green initiatives. The principles that guide policy here need to be based on political reality. Consequently moving forward should not be viewed as a case of decentralisation v centralisation (or of subsidiarity

v internal market) but of removing national barriers, especially those that distort the market, to open up all Member State markets equally. Thus policy actions to implement a single market for ICT include:

POLICY ACTIONS

- Promote advantages of a common European ICT market – using economic data to demonstrate the advantages to all.
- Prepare deregulation packages that are the most appropriate for a single market in each layer – content, hardware, software and services including telecommunications.
- Offer what national initiatives cannot, eg provide augmented services, which do not compete, for a single market in public services.
- Target the soft infrastructure as the key area to develop first for large demonstrators with EU funding under a targeted programme to illustrate the benefits of such co-ordinated EU-wide programmes (eHealth, eEducation, eInclusion, digital literacy, justice, etc). Funding centrally means sharing the cost of highly advanced services each Member State cannot afford to develop alone. Use this initiative as a key weapon to fight the recession and unemployment.
- Link such efforts to the ‘Green New Deal’, in that such large infrastructure projects should have a dimension of sustainability in all that is done in their design and engineering.
- Use public sector procurement (some 40 percent of many EU economies) to select ICT goods and services. Use open standards and open source software to promote the common EU environmental requirements for ICT products and services.

¹⁰ A cost benefit economic analysis of a single market, from Paulo Cecchini et al, has never really been examined for today's circumstances, ie the cost of non-Europe (Cecchini, 1988).

Table 2.
Potential gains from a single ICT market

Order of effect	Impact
The citizen, consumer and all commercial users	Define common users' rights and obligations in the digital era (possibly as guidelines) assuring common levels of privacy and trust for a future networking knowledge society, with support for the online consumer's contractual rights in eCommerce, etc. This should extend into a safer internet for protection of all against cyber crime for higher consumer confidence in the online world.
Media and content sector	Consistent rules on use of content would apply, with equal pricing, copyright and IPR controls, effectively with a single EU copyright signed in one Member State and valid everywhere in the EU.
Telecommunications services sector	Effective further market opening for new entrants, to enhance competition. The key target is to build a single European mobile market space and a single broadband market with many basic further steps, for example, for mobile this could imply a single EU-wide numbering plan for mobile, removal of mobile roaming charges (for cheaper communications) and reducing mobile termination rates for both data and voice, also for fixed line, while creating a common EU spectrum space, etc.
ICT goods and services of all kinds, from ICT integration to cloud computing	A larger single market without barriers for sales, a market of some 500 million consumers for goods and services. This is larger than the USA but with comparable disposable income, as well as being the leading ICT business and government market for personal digital devices, software, professional equipment such as servers and routers and all services.
The labour market	A larger labour market, if professional qualifications become recognised across the EU enlarging the scope for employment – especially in the professions – a key part of the knowledge economy.
Financial structures and systems that support trade	Better EU-wide, common payments and electronic funds transfer systems, with inter-company invoicing/ payment procedures at bank level and EU-wide secure rapid transaction capability. This will bring down the banking transaction frontiers that fragment the single ICT market and information space.

8. Revolutionising eGovernment: Rethinking Delivery of Public Services

KEY ISSUES

- Government is lagging behind the private sector in using ICT
- Public perception of eGovernment is poor – seen as cost cutting and reduction in quality
- eGovernment services are not seen as compelling
- eGovernment and eInclusion agendas are linked

How can we make eGov compelling?

Governments and public organisations are lagging well behind the private sector in using ICT in the public service. This is perhaps unsurprising given the generally poor history in implementing large public ICT projects. ICT in the public sector has usually meant just digitising and automating some back office functions. So eGovernment across the EU all too often happens in ways that simply augment the cost base of government.

Perversely, the public's perception is that government online is mainly about saving money, with a consequent decline in quality of service to the citizen. This has led to widespread dissatisfaction across the EU and a loss of trust. Less than half of EU citizens who use the internet use it to access eGovernment services, eg for forms for public administrations, such as tax returns (Eurobarometer, 2008). On average, less than half of EU citizens think the internet has improved the way they deal with public authorities; in Germany the proportion is less than one-third.

Citizens, used to interacting online with responsive commercial organisations, are often frustrated by the experience with the public sector. The problem is not only that government online presence is inadequate, but that government services are, in many cases, not compelling, ie people are often obliged to use them as opposed to making a choice and seeing value. Ironically those who get the most services from governments (eg in the area of social services) are also those with the least access. As a result, eGovernment is closely related to the eInclusion agenda. We must therefore beware a situation arising whereby public services are available exclusively online while those who most need them cannot access them or find it difficult to do so.

eGovernment and eInclusion therefore need to go hand-in-hand. Services should be made available in the ways in which citizens and enterprises can and want to receive them, via mobile phones and television, for instance, and not just online via a PC. The emergence of online social networks should also help those who are still without access (for necessity or choice) to get the benefits. Relatives, friends or non-profit associations may act as intermediaries to complement the role of government workers.

Public services 2.0

Clearly this situation must change. If we are serious about the knowledge society then we should expect government and the public sector to show leadership in provision of compelling, valued and trustworthy online services.

Figure 16. The core concerns for eGovernment policies



Source: GNKS Consult, 2008.

The knowledge society has the same potential to bring profound change in the relationship between public authorities and citizens as it has between the private sector and consumers. Focusing on this change in the relationship is the key, rather than simply using ICT to make cost savings in the short term.

But just what would 'public services 2.0' look like as a driver of social innovation in the knowledge society?

Leadbeater and Cottam (2007) imagine a citizens' collaborative world, in which '*...by turning people into participants in the design of services, they become innovators and investors, adding to the system's productive resources rather than draining them as passive consumers, waiting at the end of the line*'.

One view of the evolution of eGovernment is through a set of triple policy objectives (GNKS Consult, 2008), Figure 16.

For each level of policy goal there are different

perspectives on the nature of the user and their relationship with government. Moreover, there are different dilemmas at each level:

Efficiency – the search for government cost savings: initially, the drive is for a dynamic, productivity-driven, innovative and 'value for money' set of institutions, where the user is seen as a tax payer, and the policy dilemma is how to provide 'more for less'.

Effectiveness – the search for quality services: the next stage is for governments to produce and deliver interactive, user-centred, user-driven, innovative and inclusive services, where the user is seen as a consumer or customer. Here the policy dilemma becomes one of balancing collective needs and individual demands.

Governance – the search for public value: the ultimate objective is to achieve accountable, flexible, participatory and democratic services, where the user is seen as a social participant, voter and decision maker.

In this domain the policy dilemma shifts to the need to achieve a balance between openness and legitimate privacy and protection of interests.

POLICY DIRECTIONS

- **Policy goals to 2015**
- **Citizens as participants rather than just tax payers**
- **Increase participation levels across Member States**

We have focused here mainly on the social aspects of eGovernment. However, we note that eGovernment is expensive to implement. Large investments are involved because the scale of deployment is so huge. Establishing formal standards is difficult because of the diversity and fragmentation within and across Member States. This strongly suggests that open platforms be established for eGovernment service delivery. Open source approaches could lower the costs of deployment, and accelerate innovation. It would also be consistent with knowledge economy thinking.

Lowering costs would also help with roll out, particularly for some of the poorer Member States. Nevertheless, given the implementation deficit we currently see across the EU, implementing a citizen-centric model such as the one described above by 2015 would be a major achievement. There is no doubt it will be challenging for some Member States to achieve but it should be a target.

The issue is high on the European Commission's agenda, which is now preparing for a Ministerial Declaration on eGovernment planned for November 2009. This presents an opportunity for each Member State to respond to the Ministerial Declaration with an action plan focused on new concepts for implementation. To measure progress it will be necessary to continue to benchmark Member State advances in eGovernment – but in future this should focus on measuring citizen participation and the quality of services rather than simply whether they are online.

The knowledge society demands that the more advanced Member States go much further – rather than a 'citizen-centric' approach, government should become 'citizen-driven' with government playing the role of commissioner or broker of services rather than being a servant to citizens.

To achieve this and improve productivity and quality, clearly we will need to move beyond the traditional methods of modernisation (eg setting targets, outsourcing

to the private sector, more flexible working, etc). Instead, a new agenda for eGovernment is needed with participation as the central concept to guide service design and delivery (Leadbeater and Cottam, 2007). Such an approach should be based on principles such as the following:

- 1. As participants, people should play a much larger role in assessing their own needs in creating and devising service solutions.*
- 2. Users need to be given greater say over money and resources needed to deliver personalised services.*
- 3. Participative public services will only work with the support of staff as well as clients, so professional and workforce reform is key.*
- 4. Far more flexible use of resources is needed so that differing needs can be met in differing ways.*
- 5. New person-centric measures of success are needed, such as rating systems by users.*

Revolutionising eGovernment is a hugely significant project and a key to implementation of the knowledge society. It calls for leadership, imagination and inspiration at the heart of Europe to give the people more power to decide, plus far better services. Unless eGovernment also embraces new participatory governance and social effectiveness, it will continue to fail. It will then threaten the whole knowledge society project.

POLICY ACTIONS

- **Spread best practice to all Member States**
- **Challenge advanced Member States to fully embrace participatory eGovernment**
- **Benchmark citizens' participation in open eGovernment**
- **Establish open platforms for developing eGovernment services**

9. Online Trust: a Safe and Secure Digital World

KEY ISSUES

- Creating awareness of the types of threat in an online world, especially to critical infrastructure
- Assessing the true scale of the threats in a coherent, meaningful manner
- Mobilising action

Safety of the citizen including critical ICT infrastructure protection

Safety in a digital world has many facets. The internet promises a platform for innovation, prosperity and the improvement of general welfare but the broad reach of the loose and lightly regulated digital infrastructure brings enormous risk of harm and malfunction in the event of attack, accident or negligence. Also there are new threats to individuals in a digital mobile world, from violent videogames offline, naïve social networking to online tracking of people via their mobile handset and eavesdropping on their mobile conversations. It is now difficult to deny that this is a real threat and that it is increasing (Cane, 2009):

- More malware was identified in 2008 than in the previous 5 years combined: recession drives fraud and scams
- Over 20 countries are 'cyber-armed' for cyber warfare: eg large-scale denial of service and global virus attacks
- Websites that promote extreme views are proliferating in countries where legal structures are inadequate to control them
- There is a lack of ratification of existing cybercrime conventions

In summary, three overlapping worlds may be considered (see Figure 17): first, the world of critical infrastructure problems; second, threats to the individual in a wider digital world, offline and online; and third, the threat to a single business operating with digital productivity tools. Some threats, such as cybercrime, impact all three. Since 'cyberspace' touches practically everything, potentially there is a major risk situation for EU Member States, as well as for individuals and for private enterprise. An EU wide risk register, as used in many large commercial organisations, is a first step to understanding the threat profile, as outlined in Table 3.

Figure 17. An overview of the threats to society in a digital world shows three different perspectives

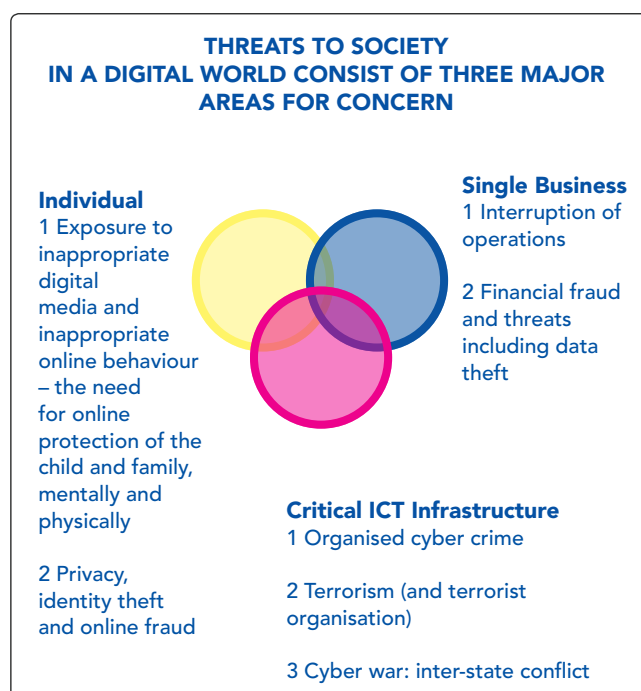


Table 3.
Outline for an EU Risk Register

Threat	Impact	Risk probability	Cost	Victim	Infrastructure layer/ point of attack
Large scale cyber attack on power grid or retail networks involving botnets	Loss of service Disruption of economy temporarily	Low	High if long lasting - €1-100 billion	General public Business National economy	Internet service layer - servers and attached business networks, possibly application services (eg email)
Loss of international cables, subsea/land	Loss of internet comms services if single point of failure	Low	Low if alternative routing, rapid repair	Internet users, especially business	Physical connection layer
Denial of services attack on emergency services eg via virus-infected mobile handsets	Loss of emergency services	Low-medium	High in human life terms, dependent on time to react and fix	Accident victims, emergency services	Communications service - connection layer
Personal alienation through digital gaming or online addiction	Mental problems-low to serious	Low-medium	Personally high	The individual – possibly a child or adolescent and the family	Application layer - online or offline
Major disabling virus	Business applications down; halt personal uses; lose confidence	Medium	Cost in down time, to repair damage and then to recover data; anti-virus measures	Individuals, Business	Application services (email/web surfing)
Loss of privacy with identity theft	Major financial losses, up to 2 years to recover	Low-medium	Personally, high; Loss of credit rating also serious long term	The individual and family	Application layer and possibly application services (eg email) and mobile communications
eCommerce fraud in purchase or eBanking	Financial loss for individual. Loss of consumer confidence	Medium-high	Direct cost of purchase or bank account contents	Individual, possibly online merchant and banks	Application layer and possibly application services (eg email) or client terminal (key loggers)

The World Economic Forum estimated in 2008 that there is a 10 to 20 percent probability of a major critical infrastructure breakdown in the next 10 years, with a potential global economic cost of about \$250 billion (WEF, 2008).

Perhaps the greatest cyber dependency is the online internet world, which in itself is now a critical infrastructure. The extreme risk is a cyberwar menacing critical infrastructures, eg, for power, communications, retail transactions, etc. The problem is that the question of security was not fundamental when the internet was originally designed, being intended only for a small and trusted community of academic and military users. The architecture of the EU's public internet is therefore not

secure or resilient to modern large-scale attacks that can reach the attached databases as well as the servers. Recent examples include the cyber-attacks targeting Estonia in 2007 and Google, Facebook and Twitter in 2009. Perhaps one of the most extreme illustrations of this threat was as long ago as 2001, following an incident in the South China Sea, when California's electricity grid was nearly shut down by cyber attacks (Cornish et al, 2009)

Cybercriminality has already become a multi-billion dollar industry that takes advantage of the borderless nature of the internet. Online fraud alone globally is estimated to be worth more than €59 billion per year (Boxell, 2009). Appropriate law enforcement is difficult with no criminal physically present at the scene of the

crime and attacks frequently routed through several countries. Most of our physical infrastructure services such as electricity, water and gas distribution, transport logistics, banking and finance, government operations at national and EU level are exposed to strategic vulnerabilities, especially through their real-time ICT-based operations and control systems. Large-scale accidents and international disasters are increasing, either man-made – eg chemical plant explosions – or are effects of global warming, as the incidence of flooding, tornadoes, forest fires, coastal erosion, etc. These all menace the physical ICT infrastructure. In Hurricane Katrina and the New York 911 disaster, mobile networks were knocked out like the fixed infrastructure. As one interviewee noted:

Few business people realise that the mobile networks are just as vulnerable as the fixed infrastructure and can take longer to restore.

Regardless of our predictive skills, rare, low-probability events of significant impact will still occur (Taleb, 2008). Thus we need contingency plans for our ICT infrastructure as well as resilience, redundancy, no single points of failure, etc. Knock-on impacts of ICT failure may infect other component parts of the same infrastructure and so have cross-sector effects (WEF, 2009). This situation becomes even more complicated when we see that online infrastructure is largely privately owned and globally operated, and mostly beyond the EU.

Perhaps the largest long-term risk is that such a catastrophe will destroy any trust ordinary people may have had in the internet and ICT usage. Loss of trust is a crucial economic parameter. Today, as a global platform for commerce and social interaction, confidence is vital. In Europe we live in a consumerist economy, where wealth is fundamentally generated and held by consumers. Thus use of the internet and Web by consumers will be the future engine of growth through consumption in the twenty first century.

Protection of all companies (including SMEs relying on outsourced computing resources in cloud computing service providers) will also be essential. Gradually, many businesses will exist on a remote server, somewhere in the world. Note that SMEs are usually the least sophisticated in cyber protection matters, and the risk of cloud computing and Software as a Service (SaaS) should be assessed carefully.

Social threats to people from ICT generally operate with somewhat different sorts of risks and targets. The risks include privacy invasion, identity theft and financial

fraud, as well as possible alienation, even psychological damage, if there is too much immersion in a digital world of gaming and online socialising. The EU needs a strategy for child and family internet safety (eg see Byron, 2008), to protect the naïve user. One difficulty is the large number of commercial stakeholders in the online world and so the way forward has to include better self-regulation. Better provision of information and education for children and families is also needed, as well as impacts of online applications in terms of effects in social and psychological development.

Protecting privacy becomes much more difficult in the internet age. The internet makes it possible to store or transfer huge amounts of data at little cost. Vast amounts of personal information can become searchable, linkable and traceable if unauthorised access can be gained. When thousands of personal records can be stored on a laptop or USB key, the loss by accident or theft of that device poses major problems. Our future in a mobile internet with its ubiquity will only exacerbate the problem.

There is a key question of inertia and political will

What must we do as our dependence on the digital and online world becomes absolute? The fragmented responsibilities for cybersecurity and cybercrime in the EU raise a key question. As one interviewee, an advisor to governments on ICT security explained:

Most Member States have lots of ICT security initiatives and councils, on the research side especially. Policy is not co-ordinated at EU level. We need to be co-ordinated if a robust infrastructure is to be built and the pitfalls of a fragmented systems monoculture avoided

The recent communication from the Commission (European Commission, 2009f) defines a plan of immediate actions to strengthen the security and resilience of critical infrastructure. However, currently there are far too many initiatives distributed across too wide an array of departments and agencies in the EU and outside. They include a common policy on cyber defence from NATO, the Cyber Defence Management Authority and the Cooperative Cyber Defence Centre of Excellence, plus international policy promises, eg G8 principles, UN General Assembly resolutions, and OECD recommendations, to name a few. This raises a key question:

How should we mobilise these random forces?

And furthermore:

Are resources, skills and experience up to meeting the

growing threat?

Most importantly, can we go beyond current thinking and practices, of which a key part is devising contingency plans for the unexpected?

Building safety and security into ICT infrastructure is urgent

POLICY GOALS FOR 2015

- **Overcome organisational and political inertia, by enhancing EU co-ordination**
- **Improve protection of critical ICT infrastructure**
- **Effective online protection of citizens and business against digital crime, malicious behaviour, inappropriate content and side-effects of digital immersion**
- **At the same time, respect human rights and intrusions on privacy**

There is a clear need to act now and rapidly. Without concrete steps, cybercrime, now in its comparative infancy, will be far larger while cyber war threats are multiplying and major accidents seem to occur more frequently. How can we move forward? As an advisor to governments when interviewed noted, protection of the existing is not enough:

Software is poor in our key infrastructures, be they financial, for utilities, or for essential protection in emergency services. Poor code has been piled on top of poor code. This will require a large-scale project to restore all poor software in high dependence situations to produce reliability and resilience. The basis should be several open source software environments.

Happily with the recent communication (European Commission, 2009f), the EU has started to conduct a dialogue on cybersecurity to develop more public awareness of the threat and risks. But we need to go further, to look more widely to the whole question of safety, incorporating the personal level of the individual in cyberspace. We must ensure respect of privacy and personal data more effectively, while creating trustworthy digital identities, ie proof positive of 'I know who I am dealing with online'. We need a shared culture of responsibility for security with families, industry, government and others in the public and private sectors all playing their part to reduce the risks.

To ensure an integrated approach with the national commitments to privacy rights and civil liberties

guaranteed by the relevant European articles, we should harmonise and integrate competing interests by first creating a holistic vision from a number of scenarios of massive failure. A vision might then seed a 'master plan' to co-ordinate the European agencies and jointly plan for, create, group and mobilise resources to address the threats confronting Europe with milestones at annual intervals.

We must also recognise the need for balancing economic security objectives with an enduring respect for the rule of law and human rights. A key element is that part of the planning and procedures developed for cybersecurity will need to assume that some attacks will succeed, begging the question, how best to recover? With this in mind, we will need a suitable portfolio of contingency plans to address such apparently rare, or 'black swan' events (Taleb, 2008).

A part of this would be organising effective citizen and business protection with far-reaching measures at the level of the various web and internet service providers, down to the base technology of the internet. Also there needs to be more examination of the impacts of digital environments on the child and family.

A master plan for action, for a safe digital environment for Europe, especially critical infrastructure protection, is one suggestion. It is based on a model we have found useful, the Obama administration's *Cyberspace Policy Review* (White House, 2009). It contrasts with recent EU and some Member State policy documents, seen so far, in that it is pragmatic about planning, responsiveness and confronting the political barriers to implementation. It takes a proactive stance, going further than simply depending on publishing principles and hoping the many stakeholders might follow them voluntarily across the EU.

POLICY ACTIONS

- **Set up a master plan, for co-ordination and for action, based on risk assessment for all areas – infrastructure, people online and business**
- **Mobilise an EU co-ordinated 'build-and-rollout' programme for each threat area with a policy for funding linked to relevant economic directions of green technology, SMEs, etc.**
- **Assure privacy intrusion is minimal in protecting the EU citizen and business**

10. Clear Leadership: Rethinking the EU's Policy Making Process

KEY ISSUES

- Need for strong leadership and coordination towards a coherent EU ICT policy
- Creating awareness that a new approach to policy is needed for a knowledge society
- Barriers to co-ordinating overall EU ICT policy versus sectoral ICT policies and national interests

Leadership is being demanded – but of what type?

Numerous experts and stakeholders consulted in this study expressed the need for leadership to usher in the knowledge society. As one of our interviewees, an expert in economics and ICT policy, remarked:

The current crisis has brought a sudden realisation of the vulnerability of the EU's development trajectory. Programmes after i2010 can contribute positively by helping to lift Europe out of the current economic crisis. We see the need for strong emphasis on applications, especially in a context of energy efficiency and greener development. We need radical aspirations combined with realistic targets.

The comment broadly reflects the view of many quite different parties – including consumer groups, industry bodies, academic experts, and MEPs – for clear leadership and planning from the EU and specifically from the European Commission. The message we took from many

of our interviews was that much good work had been done and significant progress had been made but that efforts now need to be redoubled to achieve the goal of a European knowledge society. We heard consistent support, with a few dissenting voices, for a proactive Commission to lead the way through a transparent policy making process.

This desire is perhaps symptomatic of our progress in ICT – the migration from being focused on a dynamic innovation area of high technology towards a commonly used, underpinning layer that forms the basis of everyday life. We thus need a new policy consideration, with a different approach. Put simply, since ICT has become so big and fundamental, ICT policy has to move centre stage in government strategy.

For instance, a major issue now is the introduction of digital rights for the consumer since the digital age is introducing many gaps in consumer protection. This is a new dimension, not yet covered fully. It should now become a priority for EU policy. More consumer power in legal rights for ICT is needed today since ICT use is ubiquitous. Meanwhile the 2006 Riga declaration on citizens' rights to access and inclusion has yet to be met.

Similarly, privacy and security for the user need to be addressed in many areas as user profiling may lead to scams such as phishing, so there is a new dimension to privacy in a digital age. There are major concerns about controlling companies – and government bodies – that go beyond

the recommended privacy boundaries. Thus there are questions about who monitors and who enforces.

Again the basic issue of digital literacy enters. Do we compel people to become ICT literate? Even further, some see participation in the knowledge society as becoming practically obligatory, so how should we respond to the small minority that will try to opt out? Some people have a fear of losing control of their lives in some way if they use ICT extensively. New ICT product categories often present new hazards – for example, nanotechnologies. As another interviewee from a consumer body noted:

In all such consumer/citizen protection questions, a far more proactive stance is called for, to provide effective leadership against a background of technologies arriving far faster than policy is made, and being exploited by commerce much more rapidly than the protection of the citizen/consumer is ensured.

For the knowledge society future, ICT policy has to better define this new platform that prescribes how we will live, in ways that should benefit us all. Thus policy should be right at the heart of helping society realise its opportunity in a well-engineered ICT-based economy. The Japanese realise this with a cabinet function for ICT policy and the Prime Minister as its chairperson.

Policy areas need more effective coordination in the EU, to avoid the ‘stove-piping’ that is seen all too often and to build consensus among the various actors and concerned bodies, both in and outside governments. Europe has a tendency to let a thousand flowers bloom with a plethora of sometimes overlapping and competing initiatives. This tends to dilute efforts and can often result in confusion. We need better integration of policy ideas and areas to close the gaps that have evolved over the past twenty years and to provide a more socially sensitive policy in ICT. Building on the good work so far, an integrated policy incorporating all ICT areas at a European level requires definition, endorsement and implementation.

First, a clear overarching view is needed of the divisions in policy in the area and of the balance between sectoral policy (eg ICT revolutionising the health service) and general ICT policy. Naturally sectoral and integrated ICT policies can co-exist in that the need for *sectoral* policy could be supported by a general ICT one. Where necessary, sectoral initiatives should be explicitly acknowledged. Education and health are the main such areas.

Second, whatever policy is formulated, fragmentation should be avoided as far as possible. This will require improved clarity in roles within existing EU structures.

For instance, issues concerning consumer protection in ICT are relevant to several directorates, to a greater or lesser extent. Coordination across the directorates needs to ensure transparency and consistency.

Why is there pressure for change just at this time? It seems to be a symptom of the rapid invasion of ICT into

Figure 18. Evolution of ICT policy in the EU



the European economy and society and the realisation that a suitable policy-level response over all ICT segments and facets is crucial. We may picture this as an evolution from past programmes, as shown in Figure 18.

Connecting ICT with social and economic policy

Thus the future calls for a different approach to develop a wider reaching policy – a coherent ICT policy covering all aspects of ICT in everyday life for the 21st century. The major issue is – how can we connect ICT policy more fully with social and economic policy? This implies the need for a support framework, sometimes termed the ‘governance’ for policy, to meet the challenges of

confusion and inertia.¹¹ What degree of progress we can make depends on the quality of the governance and regulatory setting to move forward, in terms of the ideas, processes and mechanisms to implement them.

Unfortunately if we frame the challenge in terms of today's Europe then we will achieve only incremental progress, perhaps some further online services located in the context of existing business models and social norms.

So there is a far more complex and difficult horizontal theme – implementing radical changes in policy, with a sense of urgency, with an imperfect process that starts by having to accommodate a multi-government, multi-institutional structure. Moreover, today's structure is likely to have its own politico-socio-economic balance rapidly transformed by citizen participation and other pressures. Thus there is a key question:

What is needed to achieve the vision in terms of a pragmatic policy framework or context in general terms when we have multiple governance forces?

If we move up a level to the knowledge economy as a revision of the established business and governance models, then we may have a chance of a more systematic approach. The question then becomes:

How can the European institutions (including the European Commission, the European Parliament, the Council and Member States, with others) best serve an emerging European society by implementing a beneficial knowledge economy?

Clarity of objectives, roles and responsibilities

POLICY GOALS FOR 2015

- Develop an overall vision of policy for ICT in the future, to be created by European institutions
- Focus on realistic targets for the key policy areas of constructing the knowledge economy, eInclusion, the Green New Deal and a single market with emphasis on SMEs
- Review the institutional framework for ICT policy and develop appropriate structures

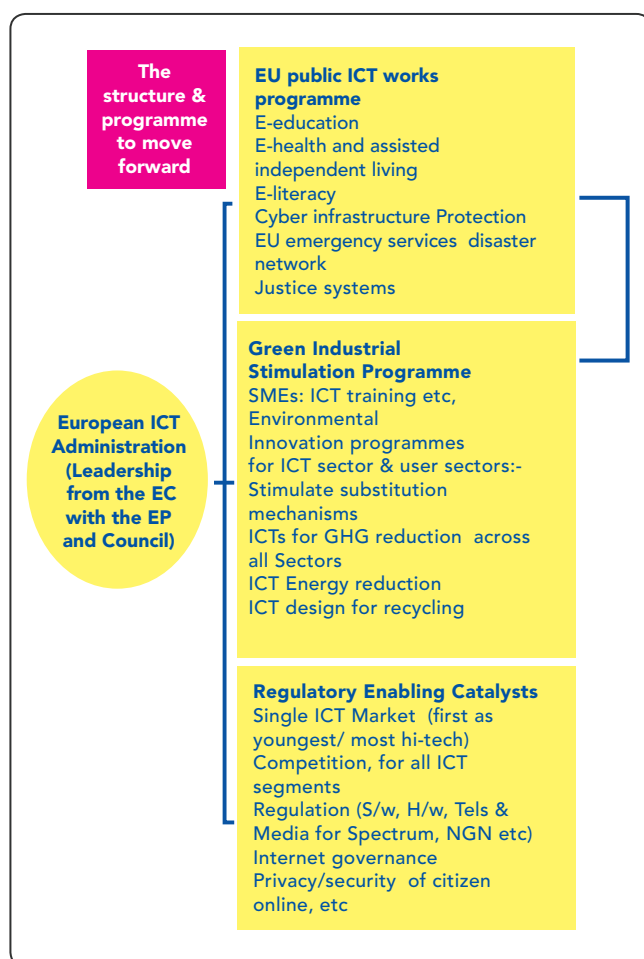
¹¹ 'Governance' has become something of a confused cliché recently, often used to mean policy-making and implementation or government but highlighting such processes which increasingly involve stakeholders other than the state, such as NGOs, industries, shareholders, etc, and is also often confused with internet governance – a very specific area and meaning..

The challenge here is to navigate the system of governance defined by the group of national governments in the EU with a multi-institutional structure made up of the various EU governing bodies. We need suitable processes for implementing the new policy, showing leadership in setting the ICT policy agenda with its path towards a knowledge economy – effective, imaginative and relevant. The danger is not that we ask too much of a future digital world but that we ask too little. Progress can only be made with clarity of the objectives of and roles and responsibilities for implementing policy, based on political buy-in by all European institutions. In consequence, we need strong, clear EU leadership with concerted action by the major European governing institutions (the European Parliament, European Council and Member States) in concert with the European Commission, for a new ICT package covering the ICT areas covered here, and summarised in Figure 19, namely:

- **Constructing the knowledge economy to respect people's rights in a digital era, as a caring society. People must be free to exploit ICT in better and more creative ways, in a world made better by them, and not made more difficult, riskier and far more intrusive. This will give the innovation Europe needs in use of ICT**
- **Social policy based on a major thrust for eInclusion and ICT for the common good, guiding and promoting a revolution in key public sector services – education, health, useful eGovernment – and critically combining them in the green economy**
- **Building a Green New Deal, for responsible eco-efficiency for ICT and user sectors. ICTs should be applied more constructively, to limit both their own damage and the damage caused by other industries to the environment – through more efficient controls on energy and materials uses as well as substitution mechanisms by ICT for built infrastructure, travel, paper, etc.**
- **Building an internal single market for fundamental common structures, whether through inputs such as spectrum, or EU-wide services that use it, such as telemedicine.**
- **Industrial policy for building the knowledge economy with a new twist – through meaningful SME support. Rather than promoting start-ups, it means identifying those SMEs with potential for innovation and growth and supporting them much more intensively, for instance, by really nurturing small firms from prototype to production, beyond the first innovation**

stage. Effectively the overall aim is an economic policy for a stronger Europe in the current crisis. This includes international ICT competition policy, open internal markets and innovation support programmes. A critical part of this is regulation for EU competition and infrastructure – balancing the encouragement of investment and competition, to ensure an open yet competitive ICT single market.

Figure 19. Connecting up ICT policy with the socio-economic objectives can build the Green Knowledge Society and a competitive single ICT market



The main motivation for an approach based on a clear integration of ICT policy is the fear that segmented and hierarchical institutions produce policies that are collectively incoherent. However the quest for more integrated public policies for ICT is gaining traction among the governments around Europe, especially in specific programmes for ‘joined-up eGovernment’. Policy coordination has been promoted lightly so far, with measures such as impact assessments and inter-service consultation in the drafting of policy, within Member

States and EU bodies. In consequence a new approach is needed. What follows is one possible suggestion.

To push the green knowledge society agenda, the EU needs an effective high-level *connecting group* – perhaps a specific European body linking the Parliament, Council and Commission for consultation and coordination. Its aim should be to ensure delivery of a coherent, integrated socio-economic ICT policy, to a timetable. Policy must also be flexible to embrace sectoral initiatives. This portfolio for the EU digital economy could be also be led, and co-ordinated by a specific appointment, or by the connecting group alone.

Reforming ICT policy will first require buy-in, ie all Member State and EU institutions working together, and then certain policy ‘tools’. In each of the areas above, the executing administration, the European Commission, should set clear roles and responsibilities for the various relevant parts of its own organisation and others. There needs to be a publicly available *responsibility map* of who does what, in terms of legislative, regulatory and enforcement roles. It should define the responsibilities for the various organs for ICT (DG Information Society and Media, Competition, Enterprise, etc) especially for directorates that touch on the rights of the citizen, competition, health, education and social welfare. This structure should also define the business process for rapid reaction to policy setting and implementation.

Following this, a next step should be to build consensus among the key institutions for change in ICT policy. Such a step could be carried out by the Commission making a draft report to the European Parliament, consisting of an outline for a future core ICT policy, with just the objectives and an overview of the responsibilities and structures. Parliament would then discuss, amend and have the choice of adopting it (a modus operandi already under way in specialist ICT fields, such as spectrum). The Commission would then execute as indicated through the connecting group, following constitutional guidelines. When agreed, two further policy tools are then required to progress, for a strong, clear policy leadership:

1. *An ICT policy ‘think tank’ (or perhaps an ‘ICT Policy Facilitator Unit’)* – for detailed policy which could be formed from existing strategy units, repurposed and strengthened. It has two major tasks. First it should review Europe’s needs, with detailed needs analyses across the EU, forming a creative outline for ICT policy as a list of priorities with targets. It should set out the situation, taking inputs from any specialist ICT units, eg the

Office of Green ICT, if that is pursued and already set up. Second, it would monitor the effects of policy on an annual basis as part of the priorities setting and suggest annual modifications to priorities. Here, the think tank could be supported by small observatories of progress for just the key sectors, ie health, education, etc. The think tank should explore the full range of innovative ideas, without limit. For instance, is there a place for a 'European ICT Green Renaissance Bank' that could support ICT, SMEs, sustainability projects and finance inclusion campaigns, and projects such as ease of use human interfaces. It should carry out a major policy review on a regular basis, based on social, economic, sustainability, industrial and security conditions.

2. *A mobilisation process and Task Force for policy*; we need to create an ICT Policy Implementation Task Force, with members selected from all EU institutions and Member States to implement the inputs from the policy think tank and co-ordinating bodies at EU and Member State level:

- **Create policy from the detailed draft: create agreement for an overall EU policy for a multi-year timeframe with ten year end-goals, based on input from the think tank, using key principles:** a) treating the EU as a society with responsibilities, enabled by ICT; b) treating the EU as similar to a corporation that must use ICT effectively to sustain itself in global markets; c) resolving the problems of sectoral conflicts at Member State level d) minimising the bureaucracy, overheads and delays in the structure that must execute policy, especially for those on which it will act – citizens and companies of all sizes.
- **Policy co-ordination:** second, the task force would build consensus for a clear policy draft. This would be done by evangelising, co-ordinating and catalysing all activities across the relevant EU policy units, stakeholder bodies and the Member States. It would need strong links to other policy areas, such as the environment, economic development, social development, etc.
- **Implement policy:** with a range of 'carrots and sticks' – these could be many and diverse but could include stimulatory funding at regional level; stronger government procurement policy for open standards, innovation and SMEs; competition policy with more rapid intervention mechanisms, etc

Success would depend on monitoring policy effectiveness through market effects, by the observatories and think tank, to measure and assure impacts for the annual

reviews, to ensure that the goals and actions being taken are always optimally targeted. The major policy actions may be summarised, as shown below.

POLICY ACTIONS

- **Enhance levels of collaboration and 'buy-in' across all institutions**
- **Review institutional structures**
- **Create policy making and implementation bodies for a new approach to ICT policy, with stronger co-ordinating links to other policy areas, such as the environment**

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Background to the study

In preparation for the Swedish Presidency of the EU, the Ministry of Enterprise, Energy and Communications, Division for Information Technology Policy, invited this report on new directions and trends in ICT issues, with a threefold objective:

- **To provide a general focus for discussion for the conference with an analysis of the current situation, trends, developments and their potential consequences for the citizen, and for EU companies and governments, highlighting the key issues**
- **To assess the value of the progress made so far in i2010, in terms of what still needs to be done, and so to provide an insight on the policy questions remaining for the EU in the future, up to 2015**
- **To identify promotional and catalytic actions needed for delivery of the 'Information Society' with innovative ideas and new thinking, identifying the policy questions not being addressed at this time**

The focus is on moving the policy debate forward with a time horizon of the next five years. The study is designed to answer a key question: How can we further the development of a common European Information Society? The consideration of this question will culminate in a major conference, in November 2009, in Visby with the Member States, the Commission and the various stakeholders.

The study was carried out by a team led by SCF Associates including:

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Thanks are due to Magnus Breidne and Andreas Gothenberg, science and technology attachés for the Swedish Agency for Growth Policy Analysis in Beijing and Tokyo, respectively.

The work programme has included desk research, an extensive interview programme with stakeholders and experts, and a creative workshop.

The general approach to the research is shown below:

Research approach in outline



