

COST Foresight 2030

Living the Digital Revolution

30 June to 2 July 2009

Workshop Report



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Introduction – the context

COST Foresight 2030 is a strategic initiative comprised of a series of workshops exploring a multidisciplinary vision for a future permeated and shaped by the Digital Revolution. Foresight 2030 is based on three pillars. First, the world is living through a real revolution – Information and Communication Technologies (ICT) and Computer and Communications Sciences and Technologies (CCST) are transforming and disrupting well-known and established processes.

The second pillar is Ray Kurzweil's 2001 essay, *The Law of Accelerating Returns*, which predicts exponential growth in all technological progress. Under Kurzweil's vision, the technological progress we can expect in the next 21 years up to 2030 is not proportional to the progress experienced in the last 21 years, but rather exponentially greater.

Third, COST Foresight 2030 is completely multidisciplinary, bringing together specialists and experts worldwide from diverse disciplines to attempt to map some challenges our future society will face up to 2030, identify trends and formulate policy recommendations at the European, national and local levels.

The primary driver of the initiative is the imperative for Europe to quickly position itself with respect to the Digital Revolution – both to harvest its potential benefits and to prepare for the inevitable societal changes that are already transforming people's lives. As the Digital Revolution continues to drive innovation and scientific progress, interlinkages among science, technology and society are becoming increasingly complex.

“What's been missing [in other foresight exercises] is the global picture. In this strategic activity we are looking for practical solutions. How can technical opportunities, particularly those related to current and future options ICT can offer, help us to define tools that are socially acceptable and will bring benefits to societies?” asked COST Office Director Martin Grabert.

As one participant pointed out, computer science research has not yet been defined in terms of the impact of ICT on humans and society. COST Foresight 2030 strategic activity is distinctive because it considers the “co-evolution” of technology and society.

The COST Foresight 2030 initiative is developing findings and policy recommendations to inform policymakers in future policy development by providing tools for social, political and economic forward thinking and by helping them to adapt to a rapidly changing environment.

The first in the series, *Harnessing the Digital Revolution*, 1 to 3 April 2009, was a brainstorming workshop on ICT/CCST. The objective was to identify key technologies that will be available by 2030 in the areas of Devices, Systems and Services and the corresponding benefits for Individuals, Society and the World.

The second event, *Benefiting from the Digital Revolution*, comprised four parallel workshops on Energy, Food Security, Life Enhancement, and Natural Resource Management, 30 June to 2 July 2009. These parallel workshops envisioned how ICT/CCST will affect the world leading up to 2030 in each of these areas. Participants identified common crosscutting trends and formulated policy recommendations.

This third and final event in the COST Foresight 2030 series, *Living the Digital Revolution*, was an exploratory brainstorming workshop. It brought together social scientists with a wide range of specialisations and expertise who focused on the major drivers of societal change influenced by the accelerating advancements in ICT/CCST for European society today and leading up to 2030.

The European Social Model (ESM) served as the normative reference for the participants' deliberations. They considered the implications of the Digital Revolution for the ESM – a vision of society that combines sustainable economic growth with improved living and working conditions. The European Social Model, which was updated by EU leaders in 2008, is based on key areas where activities at European level add value:

- Create opportunities in order to generate more and better jobs, facilitate mobility and increasing welfare.
- Provide access to healthcare, education, social services for all citizens, so as to exploit opportunities and overcome inequalities
- Demonstrate social solidarity to increase efforts to fight poverty and social exclusion and to help citizens to adapt to and benefit from the changing realities, thereby fostering social inclusion, integration, participation, dialogue and poverty reduction.

This renewed agenda signals that EU leaders want to respond to evolving new social realities, placing European values at the core of EU policies and contributing to making the EU economically strong, socially responsible and secure.

Before attending the *Living the Digital Revolution* workshop, participants were asked to consider several societal trends as they answered questions that were compiled into statements to be considered by the group. These statements, together with a list of open questions, were used to develop scenarios for the future.

The trends – ageing society; changing higher education and knowledge management; globalisation, regionalisation and the reorganisation of space; an individualised society; migration; science, technology and society in knowledge economies – were elaborated by COST Science Officers as a non-exclusive list of what could be discussed while developing the scenarios.

Workshop participants broke into three groups to brainstorm, create scenarios, identify potential trends and formulate recommendations. They considered changes to European society, but also with a global view, within the following framework:

- Social organisation – including issues such as social composition, gender issues, labour flows, migration, cities, families, and education.
- Governance – including “good governance”, accountability of decision-makers, improved decision-making, legitimacy, and citizen involvement.
- Quality of life – including well-being, health, environment, food security, and questions of sustainability.

Findings and policy recommendations

The workshop was an exploratory brainstorming aiming to:

- Identify some crucial aspects of interaction between ICT and CCST and European society in the long term.
- Focus on the implications of this interaction on the European Social Model.
- Assess and reflect on the impact of new technologies on our future daily life and how societal needs will help to shape these new, transformative technologies.
- Focus on Europe while keeping a global perspective.

“The question we are trying to answer is how should we, European society, co-evolve with technology to harvest the most out of the Digital Revolution by 2030,” said Afonso Ferreira, Head of Science Operations, COST Office.

“We are not assuming a linear relationship between technology and society in that society has to adapt,” said Simone Arnaldi, Director, Istituto Jacques Maritain, Trieste, Italy. “We are interested in understanding how the European Social Model can be preserved and European societies can change in light of the ongoing evolution of ICT and CCST.”

Thus, the workshop sought to identify the transformative elements of the Digital Revolution. Especially relevant in this context were the use of the virtual and the Web 2 social networking, as well as new ways of creating knowledge.

The shape of society from now to 2030 – a snapshot

The baseline trend for all scenarios was increasing pressure to create a sustainable future together with the possibility of a healthier population and increased longevity. Among the possible tipping points for the sea change ahead in a networked society participants identified: a deeper or a new financial crisis, a collapse of biodiversity, a global pandemic, a dramatic energy scarcity, the crash of the Internet, or a European 9/11.

However, today's inadequate governance structures and lack of global political vision will have to be replaced with new, more participatory forms of governance and visionary leadership if we are to meet our greatest social, economic and environmental challenges through intelligent, scalable ICT solutions. A key element in the transition to a sustainable, low carbon future is ICT's scale and the potential for ICT to create affordable and inclusive solutions now and in the future.

Participants envisioned an ICT-empowered "clean" industrial revolution that will be enabled by "smart infrastructure" within the energy, automotive, transport and healthcare sectors.

Driving this change will be empowered individuals, or "prosumers", proactive, empowered consumers who are ICT literate and active participants in an increasingly interconnected world. Prosumers are also producers, as they customise products and services to suit their own needs. ICT will also enhance collective and individual decision making. Tomorrow's citizens will live longer, which will usher in dramatic changes to work life and the role of the elderly in our societies. Increased longevity will create new dynamics in the lifecycle of education, work and retirement.

A major stepping stone towards the future is education. Participants unanimously agreed that education is pivotal as our societies become increasingly diverse. Increased migration will reinforce Europe's cultural pluralism – a potential source of richness and creativity. It could also prove to be divisive and to worsen conflicts over values, cultures and world views That can exacerbate emerging divides between "digital haves" and "digital have nots". Education is the way to address cultural pluralism issues, but should be accompanied by immigration policies aiming at increasing public awareness about the value of immigrants to European societies.

Radically reformed, horizontal and participatory education systems will reinforce the value of diversity and prepare young people for a world defined by inclusivity. Education will also greatly influence the degree to which the broader objectives of the European Social Model are realised.

ICT and CCST must also be used to provide education to girls and women. Women can find solutions through ICT to develop their skills in an individualised society, to act as citizens in their country and to earn a living. Lifelong learning will address the challenges of age-biased skills and knowledge deficits that have an impact on the elderly.

Participants identified additional characteristics of European society that are evolving – or likely to evolve – from now to 2030, outlined below.

- **New and different values** underlying the European Social Model are already emerging and disappearing, defining new paradigms. For example, lifelong learning will become the norm as people live longer.
- **Citizenship** will take on new and different dimensions as boundaries between the virtual and the real worlds blur.
- **Different ways of creating value** in networked economies will involve connecting individuals. Work – which could turn into lifelong work – will be redefined as creativity and human capital become paramount. Ways of distributing value will evolve and the concept of protecting

intellectual property will have to be redefined as people embrace alternative means of distribution and profit.

- **Innovation** will flourish as interconnected individuals focus on collaborative innovation in virtual spaces. Cloud computing will enable real-time delivery of products, services and solutions over the Internet by teams, eliminating the need for large-scale capitalisation. This raises questions concerning data control and ownership.
- **Security and privacy** issues will have to be addressed if people are to trust in and accept new technologies. As life enhancements technologies become pervasive and personalised medicine evolves, society will have to address ethical considerations.
- **Trust** will shift away from institutions into networks and social relationships. This is already happening in peer-to-peer lending schemes, people raising loans through online communities, micro-patronage and microfinancing. Such networks are more accountable and transparent than today's financial institutions.
- **Redefining wealth** could mean replacing economic indicators such as GDP with new metrics. This will also entail redefining – or reconsidering – growth. Is growth necessarily an aim in itself?
- **A multi-polar world is evolving.** Developing economies, led by China and India, are already challenging the collective dominance of the United States, Europe and Japan, giving rise to a multi-polar world. The global and regional reorganisation of geographical space is coupled with a shift to virtual reality, which reinforces this notion of a multi-polar world.
- **New models of governance.** As the world becomes increasingly multi-polar, new models of governance will be needed. Along with new models of political accountability and transparency, corporate governance is going to change, opening up new dimensions of corporate responsibility.
- **What role for governments?** As the world moves towards increasing globalisation, communities and governance at the local level will become more important. This raises questions about the role – and reach – of governments in the changing geopolitical and geo-economic environments. The enhanced remote communication via ICT, from current social networking tools to virtual presence technologies, will alter the concept of individual mobility. This paves the way to multiple simultaneous locations for working and family life and to multiple allegiances that cannot be fully understood through the dual framework of the national political community and of the local social community.

This raises questions about possible alternative sources of political legitimacy. Will social networking replace traditional representative democracy as a primary source of political affiliation? In addition, this challenges the traditional place-based solidarities of family, friendship, and community. Will long-distance and mediated relationships prove to be strong enough for ensuring social solidarity and cohesion?

- **Social media** will be all pervasive, creating new opportunities for expression, sharing and collaboration for communities and for business. Fears that a person may suffer from isolation in a virtual world may never materialise.
- **Low-carbon societies.** As the environment will have become a global public good and environmental awareness is growing, ICT will enable low carbon societies towards the post-fossil fuel era. People will voluntarily downsize consumption and be aware of their individual life footprints.
- **Enhanced food security.** ICT will enable smarter food production and distribution, but food security will become an increasingly critical issue as societies around the world face food and water shortages due to environmental degradation.

Policy recommendations

To realise the enormous potential benefits of ICT, policymakers need to begin developing a framework that will enable ICT infrastructure, empower citizens, encourage innovation, protect the environment by addressing the threats posed by climate change, and lay the groundwork for low-carbon economic growth.

The benefits of the Digital Revolution can only be realised by collaboration among governments, civil society organisations and the private sector. Participants formulated a series of recommendations that would create the framework for European society to benefit from the Digital Revolution leading up to 2030.

- Education and knowledge management must be reorganised to support new types of knowledge. This should be supported in all fields. New curricula as well as different styles of teaching methods and spaces should be developed to further promote the study of science and technology and engineering, but with the novelty that this should be matched with humanities, with philosophy playing a major role towards complementing the users' perspectives. This reorganisation should be accompanied by the provision of new educational facilities that will encourage new conceptual thinking. Access to knowledge, both virtual and real, should be guaranteed for everybody. Lifelong learning will become the norm for all citizens.
- Due to the increased cultural pluralism all over Europe, policies supporting multiculturalism in schools are needed to benefit from diversity and favour the integration of immigrants into European society. New policies should focus on promoting tolerance. Embracing cultural pluralism should be endorsed as a way to prevent social exclusion and poverty. Education will play a major role in this regard.
- Policymaking procedures must be changed to address what will benefit as many people as possible. The creation of experimental spaces, for example in research funding, schools and public arenas, should be developed to support research that explores spaces for creativity. In this context, society has to learn to understand that failures are useful and needed and should be considered as steps forward. Thus, research funding should also support "risky" endeavours as well as "safe" research. Experiments could, for instance, be developed in the area of political participation. What would new ways of political participation and civil society engagement look like? Successful experiments could then feed into broader implementations.
- Participatory modes of governance must include knowledge collection from a broad range of European citizens and stakeholders to create "holistic" policies. The citizens should be empowered to take a responsible action in this direction. Policies should also facilitate and allow new methods of participatory deliberation to reach global solutions through virtual spaces. Facilities and regulation should be provided to facilitate this shift.
- Universal access to wireless communication technologies must be guaranteed. Funding for improving and providing (whenever necessary) the infrastructure should be increased. Access to the skills for using ICT should be included in educational programmes as well as guaranteed for everybody through lifelong learning.
- Policies should focus on empowering individuals as they engage in various activities in society. Creativity should be encouraged and the value of human capital recognised, particularly as individuals engage in lifelong participation in society. Support for empowering individuals should be available also for increasing awareness about environmental friendly behaviour at all levels, in schools, at work, in industry and in the public sector.
- The spreading of the concept of prosumer will have a significant impact on the daily life of Europeans. Nevertheless, issues related for example to intellectual property protection,

privacy and fair remuneration might arise as a consequence of the increasing diffusion of this new behaviour. Therefore, policies should be implemented to tackle these issues and to ensure that the adoption of this new behaviour is supported by regulation both at national and European level.

- New policy frameworks and metrics are needed for measuring the success of societies. For example, we need a new definition of growth. The concept of measuring success by GDP needs to be replaced or broadened to include well-being, happiness, health and quality of life.
- In view of a shift towards low-carbon societies, a prerequisite would be the self-sustainability of the ICT industry. Major developments are needed to make this a reality. There would be a need for new regulations, but most of all, for additional funding dedicated to measures that could help this shift. One aspect to be tackled would be the development of bio-friendly materials for ICT. Funding should be allocated to research on the development of these new materials as well as on other new environmentally friendly ones which will have a substantial impact on the lifecycle of ICT industry.
- It is important to develop protocols, prices and policies around ethical engagement, involving transparency and accountability. Ethical drivers around the development of ICT must be taken into consideration.
- The spread of ICT will lead to the development of new services, which could be delivered both by individual citizens and collectively. Policies that stimulate individuals to use ICT for the production of these new services and largely promote their use should be implemented at national and European level.

Scenarios – stories about the future

Participants engaged in the scrutiny of the future through the elaboration of broad scenarios, both exploratory and normative. Such an exploration relied on participants' expertise and backgrounds. It also relied on insights from background papers and events and trends highlighted in previous COST Foresight 2030 workshops to formulate plausible alternative social, technical, economic, environmental, educational, and political characteristics of European societies' futures.

Robust scenarios are plausible and challenging, constructed to address the most critical questions decision-makers need to face now, and in this exercise, leading up to 2030. In effect, these scenarios are stories about the future – informed and provocative narratives that reflect different assumptions about how current trends and issues will play out and what new factors will come into play to create a range of different futures.

Workshop participants divided into three working groups to brainstorm about future developments, producing novel insights about the future and potential shifts in values, socio-economic structures (education, occupation, employment, poverty and income distribution), our environment, healthcare, demographics and a wide range of other factors.

Although developed separately, there are many common themes running throughout the three exercises. There are also surprising futures, sparked by high-impact, low probability events.

During their deliberations, participants were asked to consider a series of open questions derived from the responses to a questionnaire received before the workshop. These open questions were raised for discussion purposes as they represent opposing future scenarios. (The open questions are outlined in Annex I.)

Scenario I

In this scenario, participants used an energy crisis as a wild-card to enter the discussion about the future of European society. Starved of fossil fuels a short time, a systemic collapse is likely to happen. Transportation for leisure and work, household appliances, food storage and major services have all ground to a halt. Networked digital systems may have been protected, but are inaccessible to users. Vulnerable groups suffer the most – the ill, the elderly, children and the poor.

When the acute crisis has passed, it is “business-as-usual”, with no long-term consequences, except for the continuing vulnerability of European society to the energy crisis. The lasting legacy of such a crisis may be cultural rather than systemic, raising individual and public awareness about the need to limit energy dependence, and in general, about society’s reliance on technology.

Following is a glimpse of what society might look like from 2015 to 2030 according to Working Group 1’s discussion.

Social organisation

For this working group, the crucial tipping point was the enduring impact of cultural pluralism on society. On the one hand, cultural pluralism is acknowledged as a source of conflicts over values and worldviews. On the other hand, this diversity may be a source of social exclusion in general, and, in particular, a determinant of unequal access to ICT, thus adding up to the digital divides in society that already now affects more severely a few vulnerable portions of immigrant groups (e.g. elderly women).

Education has been considered as an integrative strategy to cope with this diversity: focusing on these issues, lifelong learning can therefore mitigate the potential conflict inherent in cultural pluralism.

At the individual level, lifelong learning is also crucial for exploiting the opportunities offered by ICT: by social media, that are increasingly becoming platforms for creativity and ways to (personal) success; by cooperative and participatory design technologies, that will help to release individuals’ artistic talent and creativity (for example, today’s Open-Source Car – OSCAR); by enhanced social networking tools, that have a huge potential for empowering and mobilising dispersed groups of people in the political arena; and, by enhanced communication and remote-presence technologies, that enable individuals to work mainly remotely, combining real-world and virtual-world operations and relationships.

The latter two remarks arises two crucial questions in this scenario. The first one relates to the established nation-state role and attributes: Can national-based regulatory (and taxation) systems cope with the possibility of shifting through multiple layers of activity organised, in multiple spaces, both virtual and physical? The second question is cultural and refers to how increased cooperation, creativity, and talent released by the use of ICT may drive to a re-examination of our understanding of wealth beyond simply valuing commodities and services has occurred. The concept of wealth includes intangible elements such as knowledge, learning, wisdom and self-fulfilment.

The new technological platforms and the changing knowledge and wealth will reshape teaching and learning organisations.

Quality of life

A baseline trend is that of a healthier population. This is the result of many factors including an augmented awareness of food security and diet issues, the possibility to monitor constantly the health of individuals and populations thanks to ICT, and the advances of research on nutritional and health issues.

Healthier and older populations will lead to societies where the role of the elderly has changed fundamentally, as they are more integrated into the economic cycle and involved in caring and

supporting activities in their families. Accordingly, education/work/retirement balance will need to be redesigned, with blurred boundaries and constant shifts between the these three “phases of life”. Financial support to the elderly will partially shift to alternatives to pension benefits for other forms of financial support valuing elderly people increased self-sufficiency and vitality (e.g. microcredit). Even lifelong work becomes a possible option in this scenario. The increasingly active role of the elderly may lead to a cultural change sweeping aside the old meaning of ageing and retirement.

Individual and environmental health may be harmonised thanks to incorporation of environmental values in education, eliminating the perceived trade-off between individual and collective well-being. ICT enable citizens to act as influential prosumers and to form pro-environment pressure groups.

Governance

The coming decades will be characterised by the general trend towards the reorganisation of geographical space and of the relations between real and virtual spaces (see the Quality of life section above) that will increasingly challenge national policy and legal frameworks in areas like monetary policy and instruments, macroeconomic policy, research policy and intellectual property rights, and their capacity to create wealth and implement redistributive actions.

This process is coupled with a parallel search of new forms of legitimized governance, raising issues about the accountability and responsibility of the multiple actors that crowd this arena, as well as about the need of new mechanisms for defining and enforcing regulations.

Scenario II

For this working group, the starting point was the impact of increased cultural pluralism on society considering both the benefits and potential drawbacks this will bring. Participants acknowledged the importance of ageing populations and healthcare, but did not focus on these trends. They also noted that because of time constraints, their scenario building did not include the issues of energy, ageing, health, regionalisation, gender, youth and labour.

Following is a glimpse of what society might look like from 2015 to 2030 according to Working Group 2's discussion.

Social organisation

The starting point for the discussion was cultural pluralism, which was considered as a long-term trend, requiring urgent action and behavioural change by both citizens and policy-makers due to its very high impact on European society. Increasing cultural pluralism results in a change in the population and therefore a change in values that the population shares or does not share. Increased cultural pluralism results in an increased number of values, but a decreased number of shared values.

A potential consequence is an increase in conflicting values. This will be increasingly evident in schools, which could lead to increased fragmentation. Action is needed to prepare schools to face this challenge. More integration should be promoted in public schools and new schools might be created if necessary. The value of tolerance should be further promoted.

Cultural pluralism is only one of the reasons why a redefinition of learning and knowledge is necessary. Because this is a process, it is impossible to locate it in a specific point in time as it will continue during the selected timeframe and probably also beyond 2030. Nevertheless, some specific changes were identified.

The increased diffusion and use of ICT will have a major impact on educational systems and how education is delivered. Participants considered this as key when thinking about the education of the future.

By 2015, universities will deliver their lectures in the virtual world and “virtual universities” will significantly accompany “real universities” in delivering new careers. By 2020 all public schools will be equipped with ICT and teachers and educators will have the skills to use these technologies and will teach their students how to use them.

At the same time, new forms of learning will be created to better reply to new emerging needs. For example, lifelong learning will become crucial due to changes in the normal lifecycle of the population. People will live longer and work longer, although in different functions, which implies the need to develop new tasks. More time should be dedicated to education for people who do not have ICT skills, which will enable them to better live in a world permeated by ICT. New curricula will be developed to better meet this need. Peer-to-peer education will also increase, allowing a more bottom-up approach to education.

The participants predicted these changes would be in place by 2020 and would have a medium impact on the European society. Strong political support would be needed for these changes to occur. If this happens, participants considered that by 2030 all of the active population would be ICT educated and everybody would be able to make use of ICT both at work and at home.

The high diffusion of ICT will also have a strong influence on the economy. As with education, the evolution of a virtual world will also create space for new forms of economic activity, which will be completely virtual. Matched with creativity, this could lead to the creation of innovative services based on ICT. For example, today’s simple transactions will be transformed into more complex services open to everybody and accessible from all over the world.

Participants believed this would occur around 2015, and would have a medium-high impact on society. As for education, strong policy support is needed, not only for enabling ICT access, but also for regulating the provision of these new services, which will be cross-border, and for the management and resolution of intellectual property issues that might arise.

Additional services, although not virtual, provided through ICT could include the use of humanoids and/or robot companions for assisting people to live independently and services delivered via mobile phones.

But if ICT could benefit the European economy enabling the offering of new services, on a global scale this could be endangered by new emerging economic powers, especially Asia. Europe will indeed face increasing poverty, which will reduce its global economic power. But this will happen only in relative terms. If we consider Europe *per se*, its growth will slow down but only marginally, while guaranteeing a very high quality of life for its citizens.

As a result, Europe’s decline would primarily depend on the fact that growth is calculated using standard economical indicators such as GDP. If growth is calculated with different indicators considering other aspects such as quality of life, happiness, well-being, Europe would likely still be considered as a global leader. Therefore, the development of new indicators for growth is needed and Europe could take the lead towards this change.

Quality of life

Despite changes in the economy and increased poverty, the quality of life will remain quite high in Europe. This will be facilitated by empowered citizens who will be the first in line to protect their wellbeing. The figure of the so-called prosumer which has already starting entering in our lives from the energy perspective, will permeate all aspects of our life creating a considerably strong change in

citizen behaviour as they shift from being mere consumers to proactive producers and more active citizens.

This new behaviour will have an impact on energy savings, but will also create a more responsible consumer and producer, especially in relation to food production. Such prosumers are also expected to increase their participation in governance. The large diffusion of this new concept is foreseen by 2025, with a medium-high impact on society.

Policymakers must focus on awareness raising regarding this new behavioural shift to reach as many citizens as possible. Moreover, policy intervention is also needed to eliminate several potential impending factors, for example monopolies, which might block the implementation of this new concept in some areas. Policies would also be needed to protect and regulate new forms of IPR deriving from this new type of production, as well as to guarantee a fair remuneration of this new intellectual property. Privacy issues should also be included in the political agenda.

Individuals will be more empowered, however, big corporations might still play a major role globally. It would be extremely difficult to enforce corporate accountability at global level. Therefore, the need to protect the public from global corporate power will increase. Policymakers should intervene in this process with new forms of regulation. This was perceived as something urgent (2015) and having a high impact on European society. As a result, this should be one of the top priorities for policymakers in the near future.

Thanks to more responsible behaviour among citizens and society, we can expect by 2030 to have a low carbon/low resource-use/low emission society. This will take place at individual level, but also at all other levels including industry and the private sector, the public sector and households. This will be possible thanks to the evolution of prosumers and strong political support for environmental awareness. There are two prerequisites for this to happen:

1. The ICT industry should be self-sustainable and transparency should be guaranteed.
2. There should be an ICT assisted industrial revolution, which will have a clean world as major objective for competition.

Policy support would be crucial in both cases and should focus on innovative products such as the use of biodegradable materials for electronics.

In this context the protection of the environment will increasingly important and will become central to the political agenda. Generally, will be a new awareness about the need to consider the environment as a collective good not to be exploited, but to be protected.

Food will become a crucial issue for Europe. It is expected that both food security and quality will become a major issue for Europe by 2015. Policymakers should take urgent action to avoid potential food crises and guarantee good quality food for citizens. To overcome this issue, there will be a shift in food production with an increase of local and Euro-Africa food production. It is expected that this will have a medium impact on society. The major impact will be on prices: food and water prices will increase by 2020, which will raise issues related to accessibility and affordability of high quality food.

Governance

In the coming 20 years the concept of governance will change significantly and new forms of governance will appear in our daily lives. This will be influenced by an increasing need for environmental protection, as well as the need to guarantee high standards for our quality of life. Moreover, new security issues will be the determinant for the introduction of new regulations.

By 2025 there will be a shift towards a multi-polar world where governance will be guaranteed by a few large countries or unions of countries. If Europe will be able to catch up with the rising Asian

powers, then it will play an important role in this multi-polar world. The US will see its supremacy reduced.

Governance will change significantly at local level as well. States will have to face and cope with a rise in reliance on non-state enforcement of community law. They will also need to coexist with new forms of governance developing at local level due to increasing cultural pluralism, the diffusion of ICT and social networking, and the possibility of new types of lives in a 3D world.

ICT will play a twofold role in this shift: from one perspective it is the main reason for the need of these new forms of governance as ICT reduces the importance of the concept of “place/space”. Thanks to ICT, people living miles away can feel much closer, i.e. they will engage in less place-dependent relationships. From another perspective ICT will play a key role in the development and implementation of these new forms of governance and provide states with useful tools to overcoming these issues.

Europe will also face an increasing need for security to maintain a high level of quality of life within its borders. To do so, outside border control and surveillance will be increased and migration will be regulated at a central level. This is also a precaution for what was considered a wild-card: a potential European 9/11. This was seen as an ongoing trend that will continue beyond 2030.

Scenario III

This working group adopted a normative framework and discussed a desirable scenario for European society in 2030 that takes into account the premises of the European Social Model. Participants also developed an undesirable scenario for European society that threatens that model. They acknowledged that issues of gender, energy, demographics and the role of the elderly were missing from the two scenarios.

One tipping point discussed was a deepening of the 2008-2009 financial crisis that shook the world or a new crisis that triggers changed modes of attributing value, for example, in the area of economic growth. This is not that much of a quantum leap – people are already creating new ways of value creation and new markets. However, such a change will also require visionary leadership.

Central issues identified included how to benefit from and cope with cultural pluralism; the key role of education; access to resources (technologies, education, knowledge, healthcare, energy and food); equal rights and opportunities; individual empowerment; the collective society; and issues of trust, accountability, transparency and legitimacy.

The working group identified “required framework conditions” for the desirable scenario in the three areas that include value and creativity exchange. Also required will be high-speed networks that are available, open and trusted that become more pervasive more and powerful. This enabling infrastructure is key, but will require social acceptance and individual empowerment.

Changes in the education system are paramount and people must become critical thinkers. Schools need to be transformed to foster this paradigm shift. Participatory societies will be built by empowered individuals and grass roots movements. Dissemination of information is also key, particularly research evidence to demonstrate to policymakers that new tools and methodologies can make a difference.

Following is a glimpse of what society might look like from 2015 to 2030 according to Working Group 3’s discussion.

Social organisation

In the desirable scenario, education plays a key role – there is open, universal access to education and, because people are living longer, more productive lives, lifelong learning is the norm. Education,

particularly of young people, will focus on tolerance and acceptance to reflect the increasing integration of pluralism and diversity in European society.

In the undesirable scenario, there is decreased access to knowledge and education. Socio-economic factors will reinforce inequalities and strengthen entrenched hierarchies.

In the desirable scenario, knowledge will be organised and delivered in a horizontal manner, covering a wide range of disciplines and learning will be broadly participative. Citizens will be encouraged to “learn how to think” as the learning process is active and engaging. Citizens will be intrinsically motivated to learn as education becomes part of their everyday lives.

In the undesirable scenario, there will be narrow, non-integrated, vertical organisation of knowledge as education takes on the “silo approach” to learning. For example, a biologist would not enjoy the richness of an interdisciplinary education that exposes her or him to liberal arts or social sciences.

Professional training will cover a wide spectrum of subjects and certificates/degrees will be validated by the sector. For example, a medical doctor’s degree will be validated by a community of medical professionals. In the undesirable scenario, young people will be streamed into vocational/operative training at an early age and their qualifications judged by appointed boards of professionals.

An inclusive society that embraces cultural pluralism will evolve where everyone can participate in community life, rather than an exclusive society divided by rising social inequities, riots, conflicts and wars.

New methodologies and tools to measure society’s health will have evolved in the desirable scenario. GDP will no longer be the norm. In the undesirable scenario, society will be driven by the need for “growth at all costs”.

Because the virtual world will have evolved boundaries with the real world are blurred and people use virtual spaces to alleviate social isolation and alienation, thereby complementing social needs. In the undesirable scenario, virtual spaces create social isolation and alienation, thereby replacing social needs as people escape from “reality”.

In the future, we will live in a multi-polar world. In the desirable scenario, people share and create common visions. However, a multi-polar world could also fragment society as conflicts erupt between different communities, nations or religions.

The future could be defined by respectful, social interactions, dialogue, universal access to information and literacy. Or, restricted access to information and literacy could lead to anger and divisiveness.

Quality of life

Enlightened prosumers will view the environment as a global public good and their behaviour will reflect society’s need for sustainable consumption. People will be aware of their environmental life footprint. In the undesirable scenario, there is unsustainable use of common goods. Instead of food being produced distributed and consumed sustainably, the world will be plagued by food insecurity and wildly fluctuating food prices. In the desirable scenario, there is universal food safety and access rather than a food divide, unequal access to water and rising water contamination.

In the desirable scenario there is an equal distribution of wealth worldwide and universal efforts to combat poverty. Educated consumers will manage their own health and nutrition, which leads to healthier societies. Bio-agriculture will ensure that food is nutritious. In the undesirable scenario, there is deeply entrenched poverty, poor health and conflicts over resources.

ICT helps consumers to plan and manage resources in the desirable scenario. In the undesirable scenario, poor planning of resources leads to endemic imbalances such as shortages and surpluses.

In the desirable scenario, personal, social and environmental limitations are acknowledged, rather than a world in which unsustainable consumption is the norm. Responsible individuals and collective management of natural resources replace unsustainable consumption.

Instead of no “off time”, competing pressures and demands, there is a balanced and collective use of time where people do not struggle with the work-life balance at the expense of their health and family relationships. In the desirable scenario, well-being rather than wealth is a measure of social health.

In the desirable scenario, there is an integration of green spaces and the urban environment rather than rampant urbanisation that ignores human needs and values. Societies are characterised by social “embeddedness” rather than social isolation.

Governance

In the desirable scenario, there are ethical, accountable and transparent actors and processes characterised by participatory modes of governments. The undesirable scenario is one of closed systems managed by hierarchical and totalitarian regimes. Adequate infrastructure rather than shrinking public goods characterises the desirable scenario.

Collaborative modes of innovation evolve in the desirable scenario. For example, people will be working in virtual – or real – multidisciplinary teams to create goods and services tailored to prosumers who increasingly participate in the creative process. This will lead to a new definition of wealth creation as individuals increasingly participate in society. Creative capital, such as ideas, will be valued and intellectual property will be considered as services. New forms of protecting intellectual property will also evolve as collaborative innovation takes root and grows. Social media will continue to transform societies and create opportunities.

European citizens will be protected by a responsive and informed security network in the desirable scenario. In the undesirable scenario, restricted civil liberties will be tied inadequately to security needs. In the desirable scenario, individuals will enjoy a well-defined and informed security apparatus. In the undesirable scenario, people will live in restricted societies under constant surveillance.

In the desirable scenario, individuals enjoy increased trust through new dynamic networks. In the undesirable scenario, there is corruption and a lack of integration causes people mistrust established institutions.

Annex I

Open questions

Could the future look like this?	Or like this?
Lower dependencies of relational ties from location (geographic) increases kinship (community) and family solidarity and weakens collective (local, regional, national) ties.	Family/intergenerational solidarity is challenged by ageing and conflicts over wealth distribution, national budget allocations, caring duties, employment.
Individualisation will be a dominant characteristic of European societies and penetration of technologies will be a consequence of their affordability, market availability, and individual preference.	Areas of private life are becoming an object of public policies leading to a return to strong collective identities that influence public policies (e.g. the restrictions of rights to certain groups, such as immigrants) and acceptance of technological work.
International division of labour will persist at the global level, favouring the emergence and consolidation of global networks of specialised clusters (e.g. manufacturing, software, etc.) and cities.	Augmented design and prototyping capabilities and the subsequent decentralization of the means of production (thanks to the reduction of distribution costs and the capital needed to start an industrial activity) will reverse the current productive specialisation.
ICT can increase the efficiency of individual and collective decision-making through decision support infrastructure	The opacity, the perceived complexity of, and lack of control over technological infrastructures (and related expert knowledge) supporting decision-making may de-legitimise the political process.
ICT can increase the efficiency of individual and collective decision-making through decision support infrastructure.	Individuals can be victim of "over-information" as they cannot process the amount of information they receive.

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About COST

COST is an intergovernmental European framework for international cooperation between nationally funded research activities. COST creates scientific networks and enables scientists to collaborate in a wide spectrum of activities in research and technology. COST Activities are administered by the COST Office.

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