

# SIG II-report on the ethical, legal and societal aspects of the converging technologies (NBIC)

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## Contents

<b>Introduction</b> .....	2
<b>Two views</b> .....	2
<b>Societal, ethical and legal issues</b> .....	3
Human rights and moral values.....	3
<b>Globalism, Pluralism, Identity and the European Knowledge Economy</b> .....	4
<b>Trust in Science &amp; Technology (S&amp;T)</b> .....	6
<b>Weaponry</b> .....	7
<b>Co- evolution between science and society</b> .....	7
Hypertrophy and hypotrophy .....	7
Scenarios: Trust needs a shared context and a proper public morality in S&T .....	8
Dialogue, public discourse, and communication .....	10
Education.....	11
Topics for dialogue.....	12
Frameworks .....	12
Regulatory frameworks .....	13
<b>Institutional arrangements for societal embedded technology</b> .....	13
<b>Conclusions</b> .....	15
<b>Recommendations</b> .....	15

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## **Introduction**

The purpose is to evaluate the ethical, legal and societal aspects of converging technologies in a European context, and to contribute to the recommendations of the High Level Expert Group. Members of SIG#2 had a meeting on March 19 in Paris and the results of that meeting were discussed and amended during the meetings of the NTW core group and in parallel sessions of the SIGs. This report represents the results of these activities. In the next paragraph we develop a classical problem which can - and should be - avoided in order to promote a co-evolutionary development of European societies and NBIC. SIG members have contributed by written personal views. These are integral added as a separate annex of this report. Often specific reference is made to these contributions.<sup>1</sup> This final report and 5 key recommendations were broadly agreed by all the members, and was presented to the Core Group for their further use

## **Two views**

Nanotechnology provokes Interdisciplinarity between Biotechnology (life sciences), ICT and Brain Sciences (more specific the cognitive sciences). In public debate there emerge two views on the meaning of this convergence.

*The first one, the neutral one, is that nanosciences - by its nature and heuristics- will deeply influence the other disciplines. Interdisciplinarity will emerge just due to the heuristics of nanotechnology and this is exactly the reason why convergence should be stimulated.*

The first view refers to a normal feature of disciplinary science. Every now and then, disciplines coalesce for heuristic reasons. In the first view heuristics refer solely to growth of knowledge and new technological perspectives.

*The second view on convergence is one that does not consider the heuristics solely as an intrinsic and neutral feature of nanosciences. In this view convergence refers to a technological concept of human and nature. The heuristics do not refer solely to the intrinsic good of growth of knowledge. Convergence is explicitly given a (moral) value-loaded content. The concept implies that nanosciences and convergence break (should break) through the boundaries of man, nature and technological artefacts. Convergence refers to a machine thinking metaphor and to the ideal of enhancement. Enhancement of man and nature that is the challenge of modern society and this is what it is all about.*

In public discourse, proponents of the first view like to refer to the scientific facts, to the actual state of affairs.

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<sup>1</sup> Written contributions available are from:

- Eleanora Masini: "Converging Technologies and Culture".
- Raoul Kneucker:"Converging Technologies, Legal, Ethical and Social Implications".
- Jean Pierre Dupuy: "Complexity and Uncertainty, A prudential Approach to Nanotechnology", and "Ethics beyond prudence, Towards a Normative Assessment of the New Technology Wave".
- Jürgen Altmann: "NBIC Convergence, Security and the precautionary Principle".
- Thierry Gaudin: "Converging Technologies: Points of Ethics".

The proponents of the second view like to refer to possible perspectives, to narratives and to a culture which is ready for enhancement of man and nature.

Proponents of the first view qualify narratives of this kind as utopia and science fiction.

Citizens worry about risks and ethical issues related to the second view and the response that there is “nothing new”. There is just the usual growth of knowledge. In the case of nanotechnology; the current state of Nanotechnology and convergence does not produce unintended risks or infringe values and norms at all currently.

The classical problem is that these ‘under control’ answers do not address any concerns at all. ‘Under control’ answers just re-enforce the trust problem. This is what happened in agro biotechnology.

Governments use to ask experts in such subjective controversies to do a so called “reality check” in order to provide a common ground for public debate. This is generally the beginning of the friction between S&T, government, NGO’s and dissenting scientists.

*The lesson we can learn from agro biotechnology is to avoid this pitfall.*

## ***Societal, ethical and legal issues***

### **Human rights and moral values**

It is the machine like thinking about humans and nature why convergence challenges our ideas about human autonomy and dignity and constitutional rights. Convergence raises many questions in other moral and philosophical areas also, for instance:

- the relationship between man and nature;
- about the ‘given’ of the genetic make up of living entities and the moral consequences related to that;
- the relationship between body and mind;
- the relationship between brain and “soul”;
- the existence and the character of the free will and the impact on our concepts of moral and legal responsibility;
- the (moral) relationship between living entities and non living ones;
- the relationship between the reality of existing nature and the concept of nature as a technological artefact;
- The moral aspects of delegating responsibility to technological artefacts.

Convergence situates this ongoing discourse in each of the disciplines at the cutting edge of each boundary, and brings them together. It puts the fundamental question how the scientific and technological developments are embedded in our democratic and liberal civil societies and how they are governed.

*The basic question here could be whether we are still in a state of enlightenment, where reason, expressed in science and technology, paves the way for autonomy, humanity, welfare and the environment?*

Maybe the question is a general one. How can the enhancement of man and nature made possible by the challenge of convergence, be implemented to build up these values. How can it revitalises and enforce the basic values of our liberal democracies? Is there a risk that we define our societies problems - whatever the nature of them might be -, and ourselves and our environment first, in terms of the machine metaphor?

What options do we loose by this framework, and who decides it? How dependent are we going to be on that dominant metaphor?

We need to evaluate and to articulate our values once again not only at the individual level of human and constitutional rights but also at the level of the ideals about our European societies.

The discourse is in fact one about ideals, about the “good life” in the Member States of the EU. The human and constitutional rights discourse is one; environmental ethics another one.

We should articulate what convergence will do to our ideas about the values behind autonomy and dignity, and a substantial number of other fundamental and constitutional rights. And what does it do with our ideals about solidarity? We need again to think about the right to perfection (and to imperfection) and we have to look closely again about how the right of opting out can be enabled.

Raoul Kneucker’s contribution defines the issues involved in the human rights discourse. He stresses with very convincing reasoning why we should establish groups of experts *now* which deliberate on the consequences of convergent technologies for human and constitutional rights. We should be ready when convergent technologies become a full blown item on the political agenda.

There is, however, more at stake.

### ***Globalism, Pluralism, Identity and the European Knowledge Economy***

The idea of convergence is born in the US and there we find it in its most outspoken and idealistic form. Convergence is about enhancement and artefacts. This dominant idea goes together with a very competitive US research and innovation program. In our knowledge societies here, as well as in other countries, global economic competitiveness is based on the way countries can deploy scientific developments and innovation and how they can put their products in global markets.

So there is a strong tendency in the US - as well as here - to put public morals outside the issues of the global marketplace; and in general to define public morals, worldviews, religions and identity issues as much as possible to the realm of the private individual. There is then a tendency to exclude these issues from the public moral in our liberal civil societies. In our liberal societies, we trust in a public moral constituted by some basic, collective values and human rights.

But, as we might expect, there developed a strong countervailing power against economic globalism, which only recognises individual consumer-citizens. Functional and collective,

regional identity issues are moved to the public and political realm. The Anti-globalism movement is first and foremost a movement for distributive justice and (public) moral pluralism *embedded* in and *empowered* by regional identities. They are politically potentially powerful because their focus is on collective ideals, public morals and identity issues.

In WTO, where major tariff barriers have been eliminated, we now focus more on the still existing moral and cultural differences; and the relevance for free trade.

There is a principled dispute going on in the WTO on the question of how these differences should be respected in international trade and foreign policy. In the EU, Member States exercise and develop a common moral language in the so-called legislative harmonisation procedures. And one of the hallmarks of the European identity is the way we accept and respect moral pluralism in the Member States of the EU<sup>2</sup>.

Harmonisation refers to the development of a common market, constantly under tensions by giving weight to exploring moral pluralism and respecting regional and national identities in all transactions and bargaining processes. The legitimation in civil society for the freedom of science and technology is still based on a complex set of ideals concerning enlightenment; and not only by the idea of achieving welfare via the marketplace; and the dominance of the knowledge economy.

Eleanora Masini and Thierry Gaudin stress how modern technologies might unify cultures, and Masini makes clear that identity cannot survive in a monoculture. For the establishment of identity both recognition and contestation are necessary. Both authors worry about the impact of convergent technologies on the physical body and mind. The most important disciplines are coming together and their influence on our body and mind seems so all pervasive that they really fear something like the end of societal identity and the self. Masini refers to alternatives to maintain and to enforce a *mosaic* pattern of cultures. Gaudin refers to the US cultural dominance spread by S&T and to the implicit market imperfections related to the knowledge economy. In global knowledge markets there is, according to Gaudin, a war going on, not just competition.

Gaudin and Masini both worry about the public goods; the commons as they say. They worry about the disappearance of the commons and the lack of sources for communities to develop and to adapt identity. "Converging technologies will inhabit our bodies and minds". That is what many fear. The self will not be able anymore to take a stance. The knowledge society will transform us in a society urgently in need of 'recognition'. According to Gaudin, our citizens in the knowledge society will hardly have the competence to recognise the relevance of the output of S&T. The ability to have an informed opinion or take a substantive stance towards the multitude of technological results will be the most problematic issue in our knowledge economies. Gaudin advocates for education to enforce civic countervailing power; 'resistance' in the words of Gaudin.

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<sup>2</sup>this approach will be "formalised" by the new European Convention. The European Commission has already been investigating some of the identity issues through projects such as FIDIS (Future of Identity in the Information Society) as a NoE (Network of Excellence) supported by the [European Union](#) under the [6th Framework Programme for Research and Technological Development](#) within the [Information Society Technologies \(IST\) priority](#) in the Action Line: "*Towards a global dependability and security framework*"; as well as in ORA: 63244 "The future of identity" and via Nabeth, T. and C. Roda (2002); Intelligent agents and the future of identity in e-society; Institute for Prospective Technological Studies Report; Special issue on Identity & Privacy, September 2002.

## ***Trust in Science & Technology (S&T)***

Citizens are aware of the intrusive nature of S&T, and how it changes societies. In government policy, the growth of knowledge has become the basic driving force of our liberal and democratic societies. Citizens are aware of the fact that neither science and technology, nor their experts, are neutral. Our societies have already experienced the unintended effects of new technology and complex technology systems. Governments have experienced incidents, outbreaks and crises in technological systems such as health care, food production, water management, chemical industry, energy production and so on; and society has suffered and carried the remedial costs. Insurance companies are reluctant - or just not willing anymore - to insure the risk for damages and losses resulting from technologies like biotechnology<sup>3</sup>. And still there is the fiction of being in control.

Spokespersons of governments, research and industry meet scepticism everywhere. After incidents and crises there is a strong tendency to develop regulatory frameworks in which new technological developments can be evaluated and be submitted to ethical reflection and so called risk assessment during all the stages of the production chain.

What started in the medical sciences is becoming a common good in many technological systems, due to the environmental, economic and health crises we experienced.

There is however still trust. But trust is at risk, while the value of it has increased tremendously.

Governments value growth of knowledge and innovation as the driving force for our societies and the market place, but citizen's value knowledge production and innovation just as one of the new industries in Europe. And this industry has to deal with good governance issues in the same way as multinational such as Shell and Unilever had to, and are still doing so.

Raoul Kneucker's comments are in fact made to maintain and to enforce trust between S&T, civil society and government. In his view a basic prerequisite are procedures which respect autonomy, in general, and human rights in particular. This is why he criticizes marketing strategies in communications. He refers to *real awareness* in civil society, the one which challenges people to think. Marketing strategies refer to and target consumers, not to citizens. If you want people to think and you want to build trust also as an element of social capital along the way, then you need a sense of urgency, good reasons and a lot of time.

That notion underpins his suggestion to start immediately with two actions:

- organising public awareness and
- organising reflection on human rights.

*As was said above, it should be done before the political arena has to decide, because trust is at stake.*

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<sup>3</sup> For example, asbestos insurance claims have already cost 70 billion euros over the last 20 years, and there are still 200,000 outstanding cases filed currently. See <http://asbestossolution.org/scope.html>

## ***Weaponry***

Convergence has a huge potential for and impact on military technology. NBIC will re-enforce the arms race<sup>4</sup>. The military is a special case, but equally, you can not leave it totally without constraints, even considering the novelties of their situation. Sensor networks, implants, autonomous war systems, body manipulation, new biological weapons, it will all be there, quicker than the civil society will expect. Of course NBIC will influence the perception and ideas about terrorism and its deterrence.

Complexity of modern military systems is spiralling. If unchecked by international limitations, we will see big changes to cope with this:

- Delegation of responsibility to machines
- New perspectives on organizing instability by infiltration with Nano devices.
- Invisible technology
- Arms race in the market strategy and a mix of civil and military technology
- Feed backs with civil technology
- New kinds of criminal acts
- New tools for terrorism and
- An utter lack of verification

The consequences could include:

- dangers to international peace and security,
- new threats from terrorism,
- many resources spent, with a net loss of security.

Here again groundwork has to be done on the basic values and norms, which underpin the legitimation for weapons in the post cold-war era. Can we still conceptualize this kind of arms development within the usual legal and moral interpretations of defence, deterrence, intelligence and so on?

Jürgen Altmann's contribution refers to the specific character of military preparations and their influence on international security. As with earlier technologies, introduction of converging technologies into the armed forces can increase mutual threats and decrease stability. Altmann proposes mutual limitation for the most dangerous military applications and he argues for strengthening the civil society elements in the international system.

## ***Co- evolution between science and society***

### **Hypertrophy<sup>5</sup> and hypotrophy<sup>6</sup>**

In general new scientific and technological developments, as well as existing complex technological practices, enforce re-thinking, refining and an articulation of risks and values

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<sup>4</sup> If it still exists. But the "far more interesting question, both as seen from Mars and (crucially) as seen from here, is why the US leadership, with the applause of elites, continues massive arms build-up" says Noam Chomsky on his web site on June 22, 2004 see <http://blog.zmag.org/ttt/archives/000693.html>

<sup>5</sup> A non tumorous enlargement of an organ or a tissue as a result of an increase in the size rather than the number of constituent cells

<sup>6</sup> Progressive degeneration of an organ or tissue caused by loss of cells.

over and over again. Environmental ethics and risk assessment procedures successfully encouraged the redefinition of our values and norms concerning the environment, and the way restraints are put on technological systems in the marketplace.

Now we are in a transitional stage; a new society embedded ‘sustainable mainstream technology’ is slowly emerging. The European agriculture and food industry, for instance, is changing steadily; it is more environmentally oriented, more oriented to the broad spectre of rural values, and more oriented to the issue of global food security.

A similar development is going on in biomedicine. Medical technology and health care practice constantly force us to rethink and to articulate autonomy, dignity and privacy, the concept of suffering and the sacro-sanctity of life in order to get a well balanced health care system in which we trust and feel confident.

These are two examples which show how we are able to reconstruct our scientific and technological practices and our collective identities as well, step by step, in a permanent and iterative process of redefining risks, public moral and collective identity.

Neither the hypotrophy of ‘business as usual’ which refer to a state of affairs in which only the unavoidable has to change, nor the hypertrophy of far reaching promises which get unavoidably associated with doom-and-gloom scenario’s and public concern, are the proper starting points for a co-evolutionary process. We have to find the solid ground on which to build opinion elsewhere.

The best thing to do is to create a framework for public discourse and decision making that takes a mid-term view and that operates on a case by case basis. We need a mid-term view but also institutional arrangements which allow us to develop a just in time ethics and a just in time risk management; a policy step by step a long the way of piecemeal engineering. The underlying regulatory framework should be based on best practices and be designed in proportion to the issue.

### **Scenarios: Trust needs a shared context and a proper public morality in S&T**

The relationship between science and society has changed. Nowadays S&T is seen as a part of the knowledge industry an industry which is involved in many incidents and crises. In our European knowledge economies S&T has many facets and many goals to achieve, and citizens cannot easily identify anymore with the world of science and technology. Society does not really know any longer what the driving forces are in S&T. Science and Society do not know what they respectively value anymore. Yet S&T is a hybrid on which we feel strongly dependent.

Again we call into mind the remarks of Eleanora Masini and Thierry Gaudin, who see the loss of the commons, the sources which contribute to identity formation. Their warnings against S&T related monocultures leads them to emphasise the importance of ‘recognition’ of the relevant technological developments and the importance of stimulating ‘civic resistance’ instead of promoting ‘knowledge societies’.

The four scenarios for Europe<sup>7</sup> illustrate how different basic moral values might influence Europe's identity on the long term. They illustrate the different perspectives for governments and the marketplace to balance, and to give weight to values and concerns regarding profound scientific and technological developments.

In a '*Global Capitalism*' scenario the dominant value is creating wealth via the global marketplace. Comprehensive views, civic values, identity and pluralism are reflected in a concept of a minimalist public moral. But finally it is the consumer in the marketplace and not the citizen in civil society, who dominates.

*In the 'Competitive Europe' scenario*, the Lisbon Declaration is probably best represented. Here, Europe aims to be excellent in the global marketplace, and in regional markets - but we explicitly and continuously confront wealth creation with civic values like human rights, moral pluralism and identity politics. In this scenario there is a strong orientation on national and regional identity and this (diversity) is seen as the major driving force for cultural development, European identity *and innovation*. Marketplace, moral pluralism and identity issues are strongly embedded in public discourse and political decision making. In this scenario there is space for further development of human and constitutional rights and sustainable technology. It is however an idealised scenario which aims for the best of two worlds.

*In the 'Regional Calm' and also in the 'Alternative Lifestyles' scenario* the driving force for Europe is a moral pluralism embedded in multiple regional identities, human rights, world views, environmental ethics and so on. It is from that perspective that the global marketplace is entitled to create wealth, inasmuch as it can still do so. There is a tendency however to rank regional and national growth above wealth creation in the abstract global marketplace, and there is a real belief in alternative wealth creation not based on the values of the global marketplace (*Alternative Lifestyles*).

The dominant '*Competitive Europe*' scenario includes substantive, on-going public debates on the basic issues involved and a continuous political counterbalance about technological developments and fundamental adaptation of existing technological practices. The '*Competitive Europe*' scenario implies a set of political and a set of democratic checks and balances when it comes to society; and science and technology. The hallmarks of this scenario are not revolutionary changes, but piecemeal engineering and pragmatism. In this scenario, trust between science and society is focused on the question about how much of the decision-making process can be delegated to the institutions of science and technology; how dialogue and public debate are embedded in these decision making processes, and how government can take responsibility for the institutional arrangements and the consequences of the outcome of these processes.

In other words trust depends on the way science and technology is able to internalise the '*Competitive Europe*' values and how it handles the tensions and contradictions implicitly involved. Trust depends on the way S&T is transparent in dealing with these issues in the decision making process. Trust depends on the way the institutions are successful in contributing to a continuous process of deliberation about the relationship between science, technology and society. Considering the relevance of the growth and application of knowledge for our society, and the risks which are involved, it goes without saying that the societal and political impact of new technologies are still high; and the related risk for

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<sup>7</sup> Initially the NTW EG Scenarios had different names, so the contributions referenced here may refer to those names.

damage, loss and infringement of moral values (and the consequent raising of concerns in society) remain high currently. Trust- in the '*Competitive Europe*' scenario means that we still want institutional arrangements in which the political dimension is excluded as much as possible from the internal practice of S&T, and that the basic freedom for science and technology is maintained. So on the one hand '*Competitive Europe*' values should be internalised, but on the other hand political power plays should be out there somewhere in an exposure of transparent tensions between the two. But this requires again more intelligent arrangements for public discourse, political debate and decision making in order to create and to adapt the political, financial and legal framework within which these freedoms can be exercised.

### **Dialogue, public discourse, and communication**

In general, the institutions of science and technology cherish an instrumental view on the above mentioned methodologies to communicate with civil society and government. This vision implies a unidirectional communication. From us (S&T) to them; and in most cases the general idea is that society should properly be informed about new developments. The premise is that when people are properly informed prejudices are relinquished, realistic (S&T) perspectives are shared, (moral) concerns in society can be brought 'under control' and managed, and policy crises can be prevented; and by these efforts, trust will be re-enforced. In most of the European countries policy evaluation reveals that this approach hardly contributes to the handling of morally contested developments. On the contrary, it is exactly this approach which made the co-evolutionary process in biotechnology into a disaster area. The underlying values crises are systematically underestimated when the focus is placed solely on 'honest and realistic information'; in order to create a common ground.

Science and technology simply cannot solve public values crises, neither is it given the moral authority to lead public discourse to bridge the gaps. The political imperative has to take the initiative to set the framework for such a kind of debate in which future risks and values are articulated. Referentially at the end, political debate concludes in some political rationalisation and legitimated decisions.

The issues associated with the converging technologies are risks and values related to several disciplines and brought together or about by nanotechnology. Here again the major problem is not honest and realistic information, but to design a strategy in which science and technology can foresight, together with society, about new developments. A strategy which provides the means for constructing ideas and languages together with society for bridging the value gaps and designing risk assessment procedures.

In most cases government has to provide the framework in which parties are challenged to co-operate; and government has to create the conditions under which results can be legitimated in the public and political realm. Proper frameworks prevent crises and stagnation. A good framework creates trust. Contested new developments always need frameworks which remain viable for many years. New developments need continuous case-by-case attention and frequent re-legitimation, often over periods of years.

Conditions for a proper framework include:

- It should be designed and provided with resources at the early stages of conflicts emerging; the emergence of hypo-hyper type contradictions is a strong indication for establishing a framework;

- It should take care of all the “Meta” issues to which Kneucker, Masini and Gaudin refer. Are these issues tackled in the framework and how? What can we expect? When some of these issues are excluded, where will they come in then?
- It should be designed for a long period of time, generally for several years;
- It always should focus on three issues at least; moral concern, risks and systemic pressure on society;
- It should be framed by governments and the political context,
- It should have legitimating structures or processes, under S&T and NGO’s;
- Frameworks should have a flexible content related to the state of affairs. In the beginning the articulation of values and risks, reflection, studies etc.; Later on, there is an increasing requirement for negotiation and political decision-making;
- No framework should exist without a monitoring device. It should be exercised by independent authorities; on a frequent basis;
- Case-by-case conclusions and decisions on values and risks should always have a “preliminary” status. During the process visions – and perceptions - might change;
- Frameworks should always be based on proper regulatory pillars, it should be governed by the rule of law, but in choosing the regulatory framework one should explore worldwide best practices and always be guided by proportionality. Soft legal frameworks (for instance codes of conducts) which support the autonomy and responsibility of the actors ‘as a community’ are preferred;
- Frameworks should be transparent and under Parliamentary control;
- Public discourse in which media are involved is a prerequisite for getting wider legitimation in society as a whole;
- In most cases specific institutions are created to organise the setting. Parliamentary TA institutes are very often seen as independent institutes for this kind of procedures, certainly in the beginning of the process. Later on specific bodies, also suitable for negotiations, are created;
- Governments should design frameworks in which S&T is forced to engage in a more or less continuous constructive dialogue with societal partners (CTA).

All this has to be done in order to prevent urgency and pressure in too early a stage in the political arena. In many cases where public concern is growing to a rage and public debate gets the character of a confrontation, government and politics try to get instant peace by taking rigorous measures like moratorium. Government should avoid this by creating proportional frameworks for articulation and risk assessment as early as possible. As was said earlier, establishing where meta issues come in is necessary in order to maintain trust and to avoid too much politics in the discourse at too early a stage.

## **Education**

Science and technology will continuously change our societies and an individual life; and it is without doubt that the perspectives on co-evolution depends on the way we value the meaning of science and technology in general and the way information is organised, democratic discourse is assured, decision making is organised and responsibilities are distributed. In our open societies, driven by education, we can teach youth the meaning of science and technology and we also might teach them how we value our systems by which we evaluate and decide on risks, society and moral issues associated with S&T.

The challenge is to stimulate our students in developing ‘civic engagement’ by stimulating them to be critical, to be enlightened; and that means first and for all to be free and to think as an autonomous citizen.

In education, teachers might elaborate the recent case histories about Shell’s Brent Spar, Monsanto’s GM food and Microsoft’s closed source policy. These lessons might illustrate why we still have trust in our systems and why trust only can be maintained when citizens continue to ask questions about risks and values in science and society.

### **Topics for dialogue**

The major topics which need clarification and public discourse are summarised below. So setting up a framework implies that decisions have been made where the following issues might come in.

1. Human and constitutional rights; human autonomy , dignity, privacy, integrity etc
2. Public moral, comprehensive views and societal identity
3. Economical and institutional S&T pressure on society for instance on public goods (the commons)
4. Fostering the European identity in S&T policy
5. Identifying and handling risks and their perceptions

Many of the issues mentioned before are also relevant here.<sup>8</sup>

### **Frameworks**

Quite a lot of the topics mentioned before came up in the discourse on biotechnology and ICT. Now the public debate on brain sciences is going to flourish. Nanosciences will be at the forefront of dispute within a few years; and the convergent character will renew and reframe the discourse in all the disciplines mentioned before.

However, there will be resistance now to create an overarching framework for convergence. It will be based on the argument that the individual discussions are already going on in relation to ICT, biotechnology and now brain sciences. Only when nanotechnology delivers concrete results is it time for action. There is no strong legitimation to intervene at this moment in these frameworks with arguments related to issues which might *possibly* come up in nanotechnology. In ICT and biotechnology specific regulatory frameworks are already developed and institutional arrangements are adapted to the results of public discourse. Quite a lot of deliberation and articulation has taken place and in a way, frameworks are already established and for a long period of time in a bargaining process. What has been achieved will in general be respected and lessons learned. The dynamics in these frameworks will be defended against guru-‘priests’ in the critical nanoscene who give a hyper-magnitude to their ideas, which go beyond the state of the art and a possible mid term reality-driven view.

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<sup>8</sup> Some issues mentioned before. Market imperfections associated with knowledge economies. WTO and moral issues; Dominance of knowledge; competition or battle on the global market place; the intellectual property system and convergence; the de-identifying hallmarks of modern technology and NBIC. The maintenance of mosaic cultural diversity and the constraints on the marketplace are issues. Education and civic resistance, recognition and the abuse of S&T, Anti-globalism, ICT, moral pluralism and mosaic cultures are others, as well as the ethics of weaponry and its relation with civil society.

But the challenge is to find a setting of co-operation and we will not find this through the splendid isolation of Bio, Brain and ICT.

The converging character of nanotechnology will lead to complicated decisions in the political arena. Reflection and discussions on the topics referred to above should have taken place before this occurs. Concepts for a “Nano” framework should be designed; and the one which fits the best with the other relevant converging technologies should be established as soon as possible in order to create the foundation of trust in convergence of science and politics.

### **Regulatory frameworks**

As said before, governments are involved in public discourse, risk assessment and decision making. In our EU Member States these processes are embedded in some kind of a regulatory framework due to the fact that actions of government should be governed by the rule of law. Nevertheless when we develop a framework for discourse, risk assessment and decision making we need to explore whether the existing regulatory framework already provides the means for the specific goals (referring to co-evolution) we want to explore. A good strategy is to explore best practices and to develop a specific but proportional and as “soft” as possible-regulatory framework.

In immature technologies like converging technology related to Nanotechnology the emphasise should be laid on

- conditions for reflection and expert discourse,
- monitoring systems for early warning signals,
- interactive cooperation of S&T and subsets in society in order to construct new ideas and languages on specific issues (CTA) and
- Systematically public and media debates on the results of these monitoring and deliberating procedures.
- Specific measure should be taken for risk assessment. In most cases risk assessment is embedded in formal admission procedures for experiments and the introduction of products in the marketplace. Very often these procedures cover more than one link in the production chain.

In these frameworks the public debates cannot be held by a monopoly. There is no owner of the debate. Debates are an on-going process, sometimes coming from the institutional arrangements and initiated in the framework and led by them; but often debates are triggered by the media and NGO’s in a kind of anarchy in which the institutions have to contribute and to take responsibility – normally defensive - for what has been done so far.

Related Regulatory frameworks are also needed for EU research programs like the 7<sup>th</sup> framework programme for RTD, and for specific national funding programs for nanotechnology.

### ***Institutional arrangements for societal embedded technology***

Above we discussed the ‘discourse’ interface between S&T, civil society and government. Here we focus on the internal affairs in science and technology and raise the question of societal embedding. Until now we qualified the world of S&T as suppliers of knowledge and as designers and constructors of production systems, and we saw how knowledge production,

design and construction are moving in some systems to sustainability; and in biomedicine to autonomy, dignity, self support, and equality.

Public values and risks were articulated and internalised by creating facilities for early warning signals, for reflection, for discourse and participatory procedures, by establishing ethical committees, risk assessment procedures and establishing bodies for standard setting and grading.

In these mature systems norms and values are internalised and knowledge production is influenced from the very beginning. The normative heuristic in these 'knowledge communities' changes continuously and this is of the greatest importance for co-evolution.

When a technological system starts to develop all the arrangements mentioned before, the starting point is often somewhere outside the mainstream. New research programs are developed which should protect the system and the mainstream from unintended incidents and risks. So one should also start actions which develop public legitimated systems for standard setting and grading. Systems for technology and production.

A similar development has to be stimulated for other societal issues like ethics, human rights, identity issues and law (ELSA). Here also research programs parallel to the mainstream should be established. These 'fail-safe mechanisms' which are developed alongside the mainstream; but which are focused on the imperfections of the mainstream; have in a certain way the hallmarks of a 'counter technology'. In fact CTA is one of the social technology methods by which societal issues can be transformed in the mainstream processes. It takes many years before societal embedment is completed.

Something similar is going on in risk assessment. Jean Pierre Dupuy's contribution makes clear that risk assessment is by no means a practice solely based on 'sound scientific evidence' associated with a practice of applying the precautionary principle in cases of uncertainty. By establishing a practice of risk assessment in convergent technologies, time has to be taken to explore what already is available in the constituting disciplines and what kind of cultures there are in practices where risk assessment takes place now. That is the way to find the open ends and that makes it possible to specify research for new or better methodology and to identify the areas where we should start with 'standard setting and grading' and to make a specific legal and moral context which creates trust.

However S&T is always faster than society and it is often radical. When in society functionality, attractiveness, cognitive competence, convenience and beauty are becoming dominant consumerist values; the biomedical system reacts and takes the initiative immediately. Cosmetic surgery, neuro pharmacology, genetics and reproduction technology are the answer for the need for enhancement; to prevent risks in offspring, to improve the offspring, to improve body and brain functions and to maintain beauty and attractiveness. The market as a proxy for societal values sets the agenda.

It is interesting how S&T confronts our societies with massive and radical enhancement and how the debate on public morality is provoked – often outraged - by cosmetic surgery, pharmacology, genetics and reproduction technology, but usually after the facts, and driven by lawyers fees when there are mistakes, as in the case of mammary implants. You get what you value sooner and more radical than you want. But long term it is not necessarily the best for you. And again discourse is necessary to articulate our moral values and to assess the risks

over and over again. It is important to explore what is best (appropriate) practice. Below follows a number of internalised practices by which a knowledge system reflects and reacts on value issues:

1. Enlarging peer review systems with a check on risks
2. Interviewing stakeholders in and out the academia and the technological system on the future of the system
3. Enlarging peer review systems with an ethical , societal and legal review
4. Constructive TA initiated and organised by the S&T and brought in public debate
5. Specific categories in funding programs for risks, ethics, legal and societal aspects
6. Incorporating societal, ethical and legal issues in forecasting programs
7. Creating specific institutional arrangements for deliberation and research on risks, societal, legal and ethical issues in relation to funding programs
8. Training programs on Ethics, legal and societal evaluation for students & scientists.
9. Training programs on communication and public discourse for scientists.

### **Conclusions**

*The Nano-sciences are immature. Their converging character with Biotechnology, ICT and Brain sciences requires now a framework in which co-evolution with society now and in the long term is assured.*

*The European Union has to emphasis the relevance of co- evolution and it has to explain how moral pluralism can be respected in a global competing world.*

*Frameworks are always based on regulatory pillars. The challenge is to be specific and proportional. The goal of a framework is to build trust by assessing risks and bridging the value gap, which always exists in pluralistic societies.*

*Openness and public discourse will contribute to trust formation only when S&T internalise the values of public moral. Public discourse and decision making should be framed by government. Science and technology should upgrade its internal processes in order to be able to contribute in trust building and public discourse.*

*A framework for nanotechnology which includes the converging technologies should respect what is achieved in the separate disciplinary frameworks.*

*Counter technology on standards, grades and societal issues should be established and enforced.*

### **Recommendations**

The final recommendations of the group are:

1. Create a framework for beginners. Put the emphasis on public awareness, deliberation, reflection, research, expert conferences on human rights, values norms and risks.
2. Take care for the meta- issues in your framework
3. Take care that the framework fits with that of Bio, Brain and ICT.
4. Formalise ELSA in peer reviews for foresight and in funding programs
5. 7th framework; create a program for ELSA and add money
6. Establish an independent monitoring device for early warning signals, act case by case
7. Organise ELSA networks which cooperate with the nano centres in Europe.
8. Facilitate constructive TA between S&T and subsets in society
9. Use independent organisations for public discourse and interactive participation in the member states of the EU. Use STOA and the parliamentary TA institutes for concerted participative and public discourses throughout Europe.
10. Organise a bi annual report on the state of the art of convergence in Europe.
11. Establish a specific regulatory framework for risk assessment in nanotechnology. Explore best practices and start now.