KNOWLEDGE POLITICS
CONVERGING TECHNOLOGIES

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KNOWLEDGE NBIC

Knowledge Politics and New Converging Technologies: A Social Science Perspective

Specific Support Action

CIT6

Final Activity Report 2006 – 2009

KNOWLEDGE NBIC

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Final Activity Report KNOWLEDGE NBIC

The *Knowledge Politics and New Converging Technologies: A Social Science Perspective* (KNOWLEDGE NBIC) Project was a study into the knowledge and anticipated social consequences emerging from the NBIC fields, using a social scientific perspective. It was developed in response to task 8.3.4 of priority 7 of the Sixth Framework RTD program. Task 8.3.4 is entitled 'New converging technologies and their wider implications for a European knowledge-based society'.

Coordinator and Contractors

The KNOWLEDGE NBIC Project started on April 1, 2006 and was coordinated by Zeppelin University gGmbH, a state recognised private institution of higher education in Friedrichshafen, Germany:

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- The Interdisciplinary Centre for Comparative Research in the Social Sciences (ICCR, Austria): Liana Giorgi
- The University of Warwick (Warwick, UK): Steve Fuller, Albert Tzeng
- Centre Interdisciplinaire de Recherche Comparative en Sciences Sociales (CIR, France) : John Crowley, Emmanuel Brillet
- The Foundation for European Scientific Cooperation (FEWN, Poland): Tadeusz Zoltowski
- Interdisciplinary Center for Technology Assessment and Forecasting at Tel Aviv University (ICTAF, Israel): Yair Sharan, Tal Sofer
- Forschungszentrum Karlsruhe (FZK-ITAS, Germany): Gotthard Bechmann, Christian Büscher

Further information about the Project's goals and results along with announcements of major KNOWLEDGE NBIC-related events will remain available at the following website:

www.converging-technologies.org

Project Objectives

Knowledge politics – efforts to regulate and govern new knowledge and technical artefacts - may well become one of the most significant and contentious issues for intellectual, legal, public, scientific and political discourse and action. This is especially true for fields covered by what is referred to as the NBIC (nano-bio-info-cogno) convergence paradigm, which are already producing highly contested knowledge. The project began with special attention to "new converging technologies", a term used to characterize interdisciplinary activities involving two or more of a set of four science and technological fields, namely, nanotechnology, biotechnology, information technology and cognitive science. The NBIC field is a new research area for scientific and social science communities. Despite growing public and political interest in this field of new knowledge, however, very little social science research was directly addressing it. KNOWLEDGE NBIC was accordingly conceptualized as a project combining exploratory research with networking activities in order to address knowledge politics and converging technologies from social scientific perspectives and to provide opportunities for knowledge exchange among researchers.

Main Objective

The main objectives of the KNOWLEDGE NBIC Project were to analyze the patterns of NBIC knowledge production as well as the actual and potential use of and social resistance to such knowledge. Our aim was to carry out a first preliminary assessment of this field aimed towards enabling more detailed analytical studies in the future, and, at the same time, through networking activities to help consolidate a research and policy community interested in this field of study and policy advice.

The KNOWLEDGE NBIC project comprised three Work Packages - each corresponding to one of the three strategic objectives of the project – which are detailed below.

WP1 - Objective 1: Analysis of Knowledge Production in NBIC Fields – *Research Trajectories and Institutional Settings*

Work Package 1 looked at knowledge production in NBIC fields, analyzing the research trajectories and institutional settings in which the NBIC fields are pursued and promoted. It aimed to develop a coherent historical narrative and depiction of the overall research trajectories of the NBIC fields, i.e. nanotechnology, biotechnology, information science and cognitive science, and of their interfaces. Relevant questions included: Who are the key actors involved? How do they figure in the overall ecology of both academic knowledge and socially relevant technologies? What funding mechanisms are used to promote convergence or synergy among different scientific and technological fields? Given the different origins of these fields, when and why did they start to 'converge' and to what extent?

During the first and the second year of the project, the research in WP1 focused on the research trajectory and institutional settings of the converging technologies fields. A bibliography of relevant social science literature and a database of relevant stakeholders on national and international level have been compiled. Interviews with directors of research programmes and funding agencies and with relevant NBIC researchers at the EU level and in North America, UK, Germany, France, Austria, Israel, Poland, and Australia were conducted. A cyber-conference and an international

workshop on converging technologies were organized to bring together a community interested in this S&T field. Selected papers from the workshop were published in a special issue of *Innovation* Vol 20, number 4 and additional workshop contributions appeared in *Innovation* Vol 21, number 1.

The results of the historical and sociological analysis, as well as of the interviews, were presented in an interim report (Deliverable 1, March 2008).

WP2 - Objective 2: Analysis of the Governance and Regulation of Knowledge – *Knowledge Policies and Politics*

During the second stage of the project, Work Package 2 focused on the governance and regulation of NBIC or CTs knowledge and was thus concerned with the questions of knowledge policies and politics in emerging science and technology fields. It had as an overall aim to chart, analyze and compare the context and activities – at multiple levels of governance – designed to monitor and control novel knowledge and technical capacities emerging out of various S&T fields. Such monitoring or governance activities included the setting up of national and transnational councils or ethic commissions, the implementation of new regulations, proactive assessments, guidelines, and legal norms and emerging forms of public participation (WP2).

WP2 used inputs from WP1 and supplied input for the organization of the second external workshop which was held in May 2008 in Brussels. The results of the activities carried out in WP2 were presented in Deliverable 2, submitted in March 2009.

WP3 - Objective 3: Establishing a Network of Social Science Scholars interested in the Converging Technologies and NBIC Field – *Networking and Dissemination*

Our activities were designed as exploratory as very little is as of yet known about the 'converging' component of 'converging technologies', especially from the social scientific perspective. For this reason, our project combined exploratory studies with networking activities in order to build up a community interested in this emerging S&T field of study and to extend this into a dialogue with scientists and engineers working in the NBIC fields.

The dissemination activities for the project were concentrated in WP3, which ran throughout the project. An international cyber-conference and the first project workshop (held in Vienna) on Institutional Settings and Research Trajectories were organized and took place in May 2007. A second workshop on Knowledge Politics and New Converging Technologies was organized and took place in May 2008 in Brussels. A project description brochure, a Web Site, and five rapid reports (project newsletters) were delivered. Additionally, two special issues of the journal *Innovation* 21 (4) and 22 (1) were dedicated to the publication of the workshop proceedings.

Methodology and Approaches Employed

The Knowledge NBIC Project was a Specific Support Action Project. It combined exploratory studies regarding the research trajectories, institutional settings and knowledge politics in the NBIC fields with networking activities in order to establish a community interested in the field and to initiate discussions.

The aim of WP1 was to provide a coherent historical narrative and overview of the overall research trajectories of the NBIC fields, i.e. nanotechnology, biotechnology, information science and cognitive science, and of their interfaces in technological convergence. The work for WP1 focused on the institutional settings in which converging technologies have been and are pursued and promoted, the ideology behind the convergence paradigm and its interfaces with research programming/funding, and the actual level of convergence. The historical and sociological analysis of this emerging field was informed by reviews of already existing literature, textual analyses of policy documents, and interviews with directors of research programmes and funding policy, as well as scientists engaging in NBIC / converging technologies research in Austria, France, Germany, Israel, Poland, the UK, at the EU-level, as well as in Russia, China, Australia and the U.S.. Over 35 interviews with research programme and funding agency directors, as well as NBIC researchers were conducted in the UK, Germany, France, Austria, Israel, and Poland. Additional interviews provided insight into the current state of converging technologies in Russia, at the EU level, and in North America. The insights gained from the interviews helped to explore the research trajectories of scientists in the fields of converging technologies and the potential impact of funding decisions, funding bids and new programme initiatives. By identifying and analysing literature that has played or is playing a significant role in capturing, defining and describing the processes of convergence amongst key scientific fields in particular national and transnational contexts, the consortium has established a robust narrative of the emergence of 'converging technologies'.

The second phase of our project, WP2, explored engagements with knowledge politics from the perspectives of politics, industry, civil society and science communities. In the course of our research we have documented forms of emerging "knowledge politics" and knowledge policies and conducted exploratory interviews with individuals who are responsible for implementing new governance initiatives, forming and contributing opinions concerning the need for new regulations or actions, promoting dialogue amongst the so- called public and scientific communities, and directing research programmes. We combined the monitoring of emerging governance activities with interviews with individuals involved in these and related activities asking: What is the scope of these activities? What are the objectives? What role does the enactment of knowledge politics have on the formation of policy? Who is involved – at personal and institutional levels - and what forms do exchange of expertise take?

Throughout the course of the second work package, we monitored what was referred to as knowledge politics activities, such as for example the setting up of national and transnational councils or ethics commissions, regulations, proactive assessments, guidelines, legal norms and emerging forms of public participation and procedures to respond to new knowledge and technologies emerging from "NBIC" fields of study. In the context of WP2, interviews were conducted with 52 stakeholders in total who are currently working in Germany, Austria, France, Poland, Taiwan, Israel, Canada, Belgium, Brazil and Russia. We were interested in the development of perspectives on knowledge politics and the rationale for engaging in efforts to promote or restrict knowledge production or technical capacities. What was behind and accompanying some of the written reports or regulation and governance activities that have emerged in the past years? Thus, we also focused on interviews with key leading participants in these activities, who very often pointed to examples of different initiatives and conducted their own comparisons with previous scientific developments and governance initiatives. In some countries, the number of activities specifically

mentioning “Converging Technologies” or “NBIC” was significant and in others minimal.

A third stream of our work, organized within work package 3, and which has influenced our research and awareness of on-going and emerging activities, involves our own organisation of and participation in events. This included two workshops organized by the Knowledge NBIC project, to which other scientists and civil society activists were invited, which were held in May 2007 (see Giorgi and Luce 2007) and May 2008 (see Luce and Giorgi 2009), and our participation in external activities. As a means of contributing to the development of a community of researchers interested in converging technologies, within WP3 the project also produced 5 newsletters, a project brochure and a website, which will remain active.

Work Performed

During the first reporting period from April 2006 to March 2007, the Knowledge NBIC consortium focused on the tasks of WP1 and WP3. The work on WP3 ran continuously throughout the Project. The following tasks were accomplished during the first reporting period:

- Launching and maintaining a Project web site (ICCR)
- Project presentation in form of a Project brochure (ICCR)
- Compiling a database of relevant stakeholders on national and international level (over 400) by the ICCR using input from various Partners
- Historical and contemporary sociological analysis of the changing ‘shape’ of the NBIC fields and textual analysis of relevant policy documents that assert ‘convergence’ (all partners)
- Developing interview guidelines by Warwick, ICCR and ZU. All Partners provided input to the interview guidelines (for programme directors and for researchers) for WP1.
- Over 35 interviews with research programme and funding agency directors, as well as NBIC researchers have been conducted in the UK, Germany, France, Austria, Israel, and Poland. Additional interviews into the current state of converging technologies in Russia, at the EU level, and in North America.
- Organizing a web-based global cyber-conference (ICCR, Warwick)
- Organizing a first project workshop: Converging Science and Technologies: Research Trajectories and Institutional Settings, 14/15 May 2007 (ICCR, ZU)
- Rapid reports (newsletters) (ICCR)
- Networking (all Partners)

During the second reporting period from April 2007 to March 2008, the project research focused on the tasks of WP1, WP2 and WP3. The work on WP1 was completed and a report was delivered in March 2008 (Deliverable 1). The work on WP2 began in May 2007 and continued until the end of the project. Work on WP3 continued as planned throughout the project. The following tasks were accomplished during the second reporting period:

- Historical and contemporary sociological analysis of the changing ‘shape’ of the NBIC fields and textual analysis of relevant policy documents that assert ‘convergence’ (all partners)

- Completing the reports on converging technologies institutional settings and research trajectories on national and transnational levels (all partners)
- Completion of interviews for WP1 with research programme and funding agency directors, as well as NBIC researchers UK, Germany, France, Austria, Israel, Poland, and other transnational settings
- Completing the first Deliverable "Research trajectories and institutional settings of new converging technologies" (Warwick, ZU)
- Review of WP1 interview responses for input into WP2
- Documentation of emerging knowledge politics activities in the NBIC fields and analysis of relevant documents (all Partners)
- Developing interview guidelines for WP2 by ZU. All Partners provided input to the interview guidelines for WP2
- Conduct of interviews for WP2, to be completed in year three, with representatives from politics/government, civil society and industry concerning the governance of novel knowledge
- Further compilation of a database of relevant stakeholders on national and international level (over 400) by the ICCR using input from various Partners
- A first workshop: Converging Science and Technologies: Research Trajectories and Institutional Settings, 14/15 May 2007 (ICCR, ZU)
- Publication of a special issue of *Innovation, Vol. 20 (4)*, and additional papers presented at the conference in Vol. 21 (1)
- Organizing a second workshop: Knowledge Politics and Converging Technologies, 6/7 May 2008 (ICCR, ZU)
- Rapid reports (newsletters) (ICCR)
- Networking (all Partners)

During the third reporting period from April 2008 to March 2009, the project research focused on the tasks of WP2 and WP3. The following tasks were accomplished during the third reporting period:

- Continued documentation of emerging knowledge politics activities in the NBIC fields and analysis of relevant documents (all Partners);
- Completion of interviews for WP2 with representatives from politics/government, civil society and industry concerning the governance of novel knowledge in Germany, France, Austria, Israel, Poland, Taiwan and other transnational and international settings;
- Completion of interview summaries and identification of key emerging topics.
- Completing the reports on converging technologies knowledge politics on national and transnational levels (all Partners);
- Completing the second Deliverable "Knowledge policies and politics and the NBIC field" (ZU);
- Further compilation of a database of relevant stakeholders on national and international level (over 400) by the ICCR using input from various Partners;
- A second workshop: Knowledge Politics and Converging Technologies, 6/7 May 2008 (ICCR, ZU);
- Publication of a special issue of *Innovation, Vol. 22 (1)*;
- Rapid reports (newsletters) (ICCR)
- Networking (all Partners)

Main Achievements

The final issue of the Knowledge NBIC rapid report series contains an executive summary of the project results and outputs. It is available to be downloaded from the project website.

During the first part of the Knowledge NBIC project over 400 stakeholders working on issues related to the fields of converging technologies were identified. This database has provided the foundation for the large-scale dissemination of information about project events and on-going activities and publications. The five rapid reports (project newsletters) were distributed through the database, disseminating updates about and results from the project to a broad audience.

A key result of WP1 is a report analysing the histories of "converging technologies", which was based on an analysis of texts and interviews that was delivered to the Commission in March 2008 (Deliverable 1). By identifying literature and narratives of research trajectories that have played or are playing a significant role in capturing, defining and describing the processes of convergence amongst key scientific fields in particular national and transnational contexts, the consortium established a robust narrative of the emergence of 'converging technologies'. Over 35 interviews were conducted in order to explore the research trajectories of scientists in the fields of converging technologies and the potential impact of funding decisions, funding bids and new programme initiatives. All partners delivered country reports on the interview findings, which are available as separate appendices to the main report of the deliverable. The research conducted for WP1 provided input for the research being carried out in the context of WP2, as well the development of further networking opportunities relevant to WP3.

A key result of WP2 is an analysis of the regulatory actions and knowledge politics in converging fields of science and technology that was delivered as a report to the Commission in March 2009 (Deliverable 2). As part of the work of WP2, an initial list of emerging activities related to the governance of converging technologies and novel knowledge in the countries of project partners and other international settings was developed, paying attention to the format of the activity, expected participants, scope of dissemination and further developments. An interview guide was developed in order to explore experts' perspectives on governance activities, the need for new initiatives or sufficiency of existing frameworks, and the means by which potentially new forms of knowledge governance (both to restrict and promote knowledge) might emerge. Project partners conducted 52 interviews for WP2, which were summarised and analysed. Consortium members have also been active participants in discussions regarding the governance, regulation and science-society interface with respect to converging technologies and related fields of science. The knowledge gained as a whole from the research for WP2 is incorporated into the first part of Deliverable 2 and contributions from partners regarding specific contexts in which knowledge politics meets converging technologies comprise the second part of Deliverable 2.

The significant results of the research have been disseminated throughout the project, coordinated by WP3, which was dedicated to both networking and dissemination. During the three years of the project over 400 stakeholders working on issues related to the fields of converging technologies were identified. This database has provided the

foundation for the large scale dissemination of information about project events and on-going activities. A good basis for the publicity of the KNOWLEDGE NBIC Project has also been achieved through various dissemination activities, including the maintenance of a project website (which includes links to related activities, organisations and reports) and the distribution of 'rapid reports' in the form of an electronic and/or hardcopy newsletter.

The first project workshop, Converging Science and Technologies: Research Trajectories and Institutional Settings, took place from May 14-15, 2007 and was organized by ICCR, ZU. This workshop featured 23 presentations on current research on converging technologies in the social sciences and humanities, with a total of 85 registered participants. A special issue of *Innovation* on Converging Science and Technologies was published as a result of this workshop (edited by Liana Giorgi (ICCR) and Jacquelyne Luce (ZU)) in December 2007, with additional conference papers being published in *Innovation* 21 (1).

The second workshop was prepared during the second reporting period and took place in May 2008 in Brussels. This workshop featured presentations on current work with respect to the regulation of converging technologies, with a total of 40 registered participants. A selection of papers from the second workshop was published in *Innovation: The European Journal of Social Science Research* in issue 22(1) (edited by Jacquelyne Luce and Liana Giorgi) in March 2009.

Relation to the State of the Art

Contribution to the social scientific study of CTs

The Knowledge NBIC project began in 2006 in response to emerging discussions about converging technologies or a potential new convergence paradigm for scientific knowledge production, as well as shifts in understandings of how, by whom and at what stage novel knowledge and technical artefacts should be governed. Converging Technologies was defined in the executive summary of the report *Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science*[1] as

> the synergistic combination of four major "NBIC" **(Nano-Bio-Info-Cogno)** provinces of science and technology, each of which is currently progressing at a rapid rate: (a) nanoscience and nanotechnology; (b) biotechnology and biomedicine, including genetic engineering; (c) information technology, including advanced computing and communications; (d) cognitive science, including cognitive neuroscience. (Roco and Bainbridge 2002:ix)

When the High Level Expert Group Foresighting the Next Technology Wave published its report *Converging Technologies: Shaping the Future of European Societies* (Nordmann 2004), they defined converging technologies as "enabling technologies and knowledge systems that enable each other in the pursuit of a common goal" introducing another acronym, namely CTEKS - Converging Technologies for a European Knowledge Society. Here, an emphasis was placed on goal-oriented enablement, or as

[1] A PDF version of the report is available for download at: http://www.wtec.org/ConvergingTechnologies/ (last accessed 24 March, 2009).

Alfred Nordmann notes in another context, the act of converging *upon* rather than just simply converging.[2] Since the publication of these foundational reports, "converging technologies" per se has moved in and out of public and policy, as well as social science and humanities, sight. The innovative and economic potential of a converging approach has been the subject, or premise, of various workshops and reports. The "reality" of "convergence" has been brought into question, with a number of projects striving to define whether sciences and technologies are converging at all, and if so, which types of converging clusters can be identified. The methodological approach employed in the Knowledge NBIC project involved studying the ways in which converging technologies and NBIC fields emerged as questions, subjects and modes of knowledge production and knowledge politics. As a consortium we did not restrict ourselves to working within the framework of a consensus definition of converging technologies, but rather from various social science perspectives looked at how scientific practices and new governance initiatives relating to novel knowledge are shaped by new developments and innovation strategies as well as the various representations of them. This in many ways echoes a so-called "bottom up" approach - which is often employed in discussions regarding scientific practice - to defining the terms, parameters and characteristics of what we study. Yet, this was done with conscious attention to the manner in which knowledge production is embedded in social and political processes that inform the directions of scientific research which are taken in various jurisdictions. The multiplicity of perspectives contributes to the state of the art of research on converging technologies by making explicit the manners in which the concept is mobilised for particular purposes and how its usage differs within various contexts.

Comparative dimension

Maintaining an open approach to the definition of CTs (and NBIC, CTEKS, as well as other formations), has also contributed to the development of initial understandings of how knowledge politics related to "fast-paced" emerging science and technology fields can be studied and engaged with at local, national and international levels. The combination of knowledge gained from the two work packages – first on research/career trajectories informing the emergence and practice of converging approaches and second on activities and strategies to monitor and govern knowledge at the interface of key sciences and technologies – enables investigation of social and infrastructural changes which contribute to the anticipated involvement of particular parties in knowledge politics. The perspectives of interviewees from specific cultural contexts and who identify with particular interests can be brought into conversation with each other to establish greater in-depth understanding of both new and old modes of addressing science (and knowledge) governance.

Thus, the comparative aspect of the KNOWLEDGE NBIC project facilitated insight into the contours of science policy, funding programmes, and scientific practice at local levels in WP1 and, by identifying key policy fields and analysing knowledge politics that have played or are playing a significant role in regulating knowledge production and the use of knowledge in WP2, the consortium has established a sound analysis of the multiple levels at which the governance of 'converging technologies' is performed. The international composition of the workshops organised by the project provided

[2] See Giorgi and Luce 2007 for articles which carry out comparative analyses of the discourses within the reports.

opportunities for researchers from various backgrounds to discuss the conceptualisations of CTs, various emerging technology platforms and emphases on new governance mechanisms with each other, with the publications of selected presentations disseminating the results to a broader audience. Furthermore, the annexes to the main reports of each deliverable provide details on the specificities of research trajectories, institutional settings and governance initiatives in particular national or transnational contexts.

An emphasis on the importance of national level governance was accompanied by strong statements concerning the impossibility of not addressing governance needs at a transnational or global level. Examples provided of areas in which converging technologies may increasingly play a role – such as, agriculture and food production, food safety, and medical technologies – highlight the mobility of new technologies, as well as the ethical, social, and environmental questions which they might raise but which may be differently shaped in various cultural contexts. The mobility of scientists and administrators which was noted in the interviews for work packages 1 and 2, but also at the project workshops, also point to the need for further comparative research and new conceptualisations of how this might be carried out.

Networks of interested researchers

A further impact of the project on the research community was the organisation of two international conferences and the production of 5 rapid reports, activities which aimed to engage researchers in the topic and to provide forums within which the study of questions concerning the interface of converging technologies with knowledge politics could take place. The conferences offered opportunities for researchers addressing knowledge governance issues from various perspectives to strengthen their understanding of the contribution of different methodological and theoretical approaches to the topics. The conferences also opened up the areas of science and technology being considered as particularly relevant to converging approaches and converging technologies analyses. A selection of the papers presented is published in two co-edited special issues of *Innovation: The European Journal of Social Science Research* as well as in an additional issue. Additionally, the researchers of the Knowledge NBIC Consortium have been involved in local, national and transnational discussions about governance initiatives, the role of the social sciences and humanities in foresight projects, public engagement activities and regulatory discussions, and global governance.

Further research and SSH participation in governance initiatives

During work package one partners addressed the role of disciplinary restructuring, educational and research programmes and public and private funding sources in the current patterns of knowledge production, particularly with respect to NBIC fields or areas in which technological convergence is a key premise. In work package two this foundation was extended to explore the involvement of actors from various spheres in defining priorities and setting boundaries not only on the use of knowledge but also its production. The research that was carried out throughout the project highlighted the manners in which tensions between what is considered tradition and what is considered novel are evident in narratives of technological development and knowledge production, as well as knowledge governance. Contested discussions about the feasibility of technological developments proposed within some spheres of CTs discourse also draw attention

to the mobilisation of past-future imaginaries, with perhaps a tendency to minimise analysis of present-day implementation of knowledge. A number of key further research questions and topics emerged throughout the project, into which interviewees provided insight such as: a) the cost of contemporary "participatory" governance; b) How could one implement programmes by which individuals participating in ethics of science and technology committees would have the time and resources to develop a solid knowledge base upon which to make reflective recommendations?; and c) What forms of collaborative research would facilitate investigation of the multiple interfaces with public policy which characterise current science and technology fields?

As Liana Giorgi states in the Executive Summary of the project produced as the 5th rapid report in the Knowledge NBIC series:

> "What much of the above knowledge politics sites leave untouched – either entirely or in part – are the normative implications of nanotechnologies and converging technologies – in other words, not so much the question of 'how' to cope with emerging technologies but rather, 'whether' at all or to what extent.

This break between many of the public engagement and governance activities related to converging technologies and philosophical debates about the normative implications may need to become a site of investigation and practice in order to meet the demand – by ethics committee members, parliamentary representatives, funding directors and 'lay' citizens – for the capacity (based on knowledge) to make informed decisions and introduce models of and for flexible governance. A growing emphasis is being placed on the participation of 'lay' citizens and scientists in the governance of science and knowledge. How these expectations will be enacted in relation to converging technologies and to what effect remain to be seen. At the moment what can be noted is the manner in which existing NGOs, CSOs and topic or disciplinary based institutes are becoming a part of emerging discussions, but also the ways in which the convergence of issues and technologies transcends the borders of select expertise.

As converging technologies and the various key 21st century enabling technologies enter their next generation of development, the social, political, cultural and economic questions that they pose are expected to enter new spheres of discussion. Through its main reports, rapid reports, organisation of workshops, edited journal issues and on-going work on the dissemination of project results, the Knowledge NBIC project has contributed to both the identification of emerging governance subjects and questions, as well as the analysis of emerging sites in which knowledge production and politics are enacted.